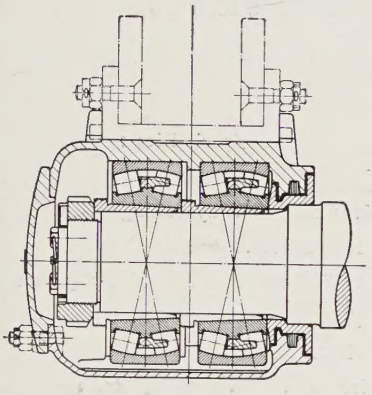
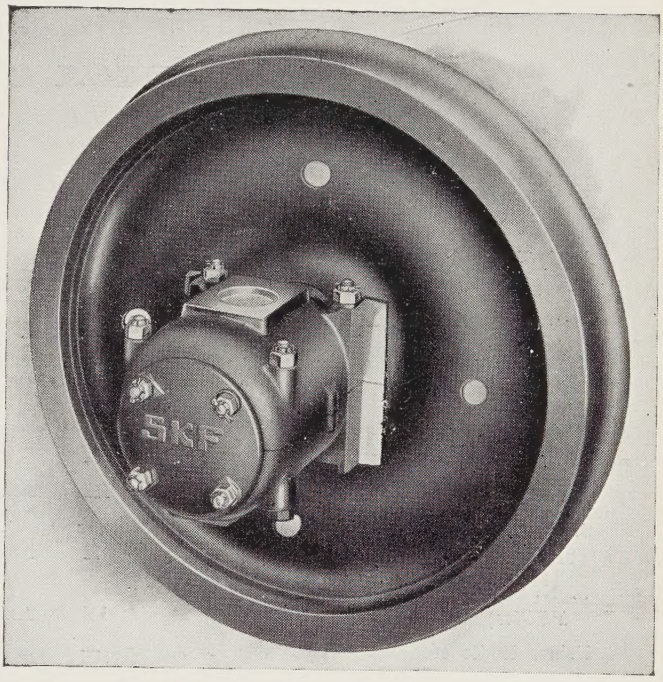
OL. XXIII. — N° 6. SEPTEMBER 1946

# Monthly Bulletin of the International Railway Congress Association

(English Edition)

# Advantages of SKF Axleboxes






- Prevention of heating
- Saving of lubricant
- Least of maintenance cost
- Best efficiency of rolling stock
- Decrease of starting resistance
- Increase of working safety
- Reduction of running tractive effort

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# MONTHLY BULLETIN

OF THE

# INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

(ENGLISH EDITION)



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**An edition in French is also published.**

VOL. XXIII. — No. 6. September 1946.

BULLETIN
OF THE
INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

[ 656 .234 ]

# Tickets,

*Continued* (*).

by Mr. LIONEL WIENER,
Professor at the University of Brussels.

## PART E.

## TICKET REPRESENTATION OF TARIFFS. SPECIAL TICKETS.

*Publishers Note.* —We think we are meeting the wishes of our readers by publishing the last part of Mr. L. WIENER's article on « TICKETS ». The author died at the beginning of the war.

*Part E*, the beginning of which was published in the July 1939 Bulletin, ends this study, publication of which began in March 1938.

### 3. — Reductions to members of a family.

**3. 1. — Various members of a family.** — So that the cost of travelling shall not be prohibitive, certain Railways grant reduced rates to members of the same family. These may consist of a certain percentage of rebate for the third member, a higher rebate for the fourth, up to a maximum rebate for additional members. In France, there are family tickets *(Fig. 915)*, as well as tickets for all the members of large families.

A similar idea led to the introduction of special tickets for « fiancés » and honeymoon journeys in Italy, Tunisia, and elsewhere.

Generally speaking, each category has its own tickets, although to simplify matters, some of them are common to other categories enjoying the same privileges. In France, for example, tickets with a 90 % reduction granted to the adult and child members of large families, are also used for ex-servicemen entitled to the same reduced rates.

(*) See *Bulletin of the International Railway Congress Association*, No. of March, May, July and September 1938, p. 217, 473, 665 and 893; No. of July 1939, p. 673 (beginning of *Part E*).

3. 2. — **Children.** — Infants are usually carried free, and children between certain ages at half price. The age limit varies from country to country and railway to railway, but is usually between 10 and 14 years (1). In actual fact, reduced rates apply to children after these ages, as there are special rates for scholars.

As such reduction are granted nearly everywhere, special tickets must be issued to cover them. Some Companies have special tickets for children; others use adults tickets for children by detaching a portion, which is retained by the seller, while others make use of tickets for several special categories, one of which is for children, the category in question being marked on the ticket.

PAPER TICKETS. — Books of coupons for fixed journeys and books of coupons for various through journeys, as well as other paper tickets have a perforated stub « for children » that can easily be detached. While the stub is attached to the ticket, it is sold at the full rate; when the stub has been removed the reduced rate applies. This « child » stub is triangular when it is situated in a corner of the ticket, or rectangular if it is on the lower half or right hand side of the ticket. We have already quoted examples and illustrated such tickets :

Book of detachable coupons;
Book of coupons used in various combinations (*Fig. 92* and *93*);
International card;
Free pass (*Fig. 425*).

In America, strip tickets and other paper tickets always have a space which is perforated, as well as the voucher, when the ticket is sold at half price. The whole voucher is thus a receipt, and these tickets differ in principle from European paper tickets as all information relating to the journey is given on them as well as the fact that they are sold at half price.

EDMONSON TICKETS FOR CHILDREN. — In countries where tickets are sold at reduced rates, as in Belgium where children only pay half price, no special tickets are printed for the purpose.

Many countries use ordinary tickets for children, the reduced rate applying when some portion of the ticket has been detached to record the fact.

Certain English and Continental Companies cut the ticket diagonally when it is used for a child (2).

---

(1) Likewise on tramways. The age limit is 12 years in *Bristol*, 14 in *Wolverhampton*.

In France children enjoy a reduction of 70 % on family tickets up to the age of 7 only (Fig. 916).

The reduction is allowed in Austria up to 14 years.

In England, reduced fares for juveniles are also granted in the case of excursion tickets up to the age of 16; members of the « Southern Ry's Brigade » are granted these reduced rates from 16 to 18 years.

(2) This is done in Switzerland. Some of the former English Companies used to do the same : the *Midland Ry.*, the *London Tilbury & Southend Ry.*, the *S. M. Jn. Ry.*, the *Great Central Ry.*, the *Great Northern Ry.*, the *London & South Western Ry.*, the *London Brighton & South Coast Ry.*, the *South Eastern & Chatham.*

Various Welsh and Scottish Railways did the same. (The *North British Ry.*)

Amongst the present Companies; the *Southern Ry.*, the *L. P. T. Board* and the *Great Western Ry.*, continue this practice.

Some of these Companies also divided their return tickets.


Edmonson tickets. (Scale 4/5.)

Fig. 916. — Children from 3 to 7 years, family rate — two coloured free pass. *Est Railway* (1906).

Fig. 917. — Half price return tickets for child under 14 years — 1936. — Distintive marks in white on a coloured ground. — *Vienna-Aspang Ry.*

Fig. 918. — Half ticket for a child. — Category : « Privilege » with distinctive letter. — Valid for one month. — *Southern Ry.*

Fig. 919. — Child's ticket surcharged with a distinctive mark. — Parliamentary 3rd. class fare. Local. — *Taff Vale Ry.*

This system is not so practical as the former, as only part of the printed text remains in the hand of the passenger (Figs. *460*-918). This has been remedied in the West Indies by printing a diagonal line with the same text on either side *(Fig. 695)*.

When a ticket is used by a child, other British Railways are in the habit of punching out a portion giving the number of the issuing station and the name of the arrival station, as well as indicating the rate or category of ticket if necessary. This is done in various ways :


Children's tickets. (Scale 4/5.)

Fig. 920. — Back of soft cardboard ticket issued by the *London County Council Tramways*. — Different reduced fares at different hours of the day.

Fig. 921. — Half price ticket. — *New South Wales Govt. Rys.* — White diagonal line.

there are rectangular (1) (Fig. *459*), polygonal (Fig. *236*), semi-circular (2) (Fig. *165*) or triangular (3) (Fig. *237*) fragments, some of them of considerable size (Fig. *457*).

When special Edmonson tickets are printed for children, they differ from the ordinary tickets by the text, price and colour. They are often two coloured. In France, half price tickets have always been used which are also issued to children; certain Companies distinguish these from the others by a diagonal line and the addition of the word « Child » (4) (Fig. 921). In Germany before 1914, and on certain English Railways, a blank space 5 to 10 mm. (13/64 to 25/64 in.) wide was left along the short side of the face of the ticket (5) (Fig. *648*).

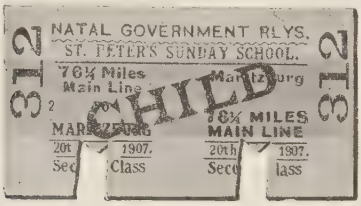



Fig. 922. — Child's ticket. St. Peter's Sunday School. — Excursion on a fixed date up to so many miles on the main line. — *Natal Govt. Rys.*

Some Companies use tickets of the usual colour which only differ from ordinary tickets by being overprinted with the word « Child » or its equivalent (Fig. 922-923), or by including the word


Figs. 923 *a* & *b*. — Front and back of child's single ticket, printed on cardboard, issued by the *Paris Ceinture Ry.* for the Luxembourg Prince Henry Rys. — Names of both Companies. — Value in marks.

« child » or « kind » in the text (6). In spite of this, some of them also overprint the tickets with the word « child » in block or hollow letters, or an equivalent word, or in exceptional cases a conventional sign (Fig. 919). This is done not

(1) In particular most of the Scottish and Irish Companies, certain Welsh lines (the *Rhymney Ry.*, the *Cardiff Ry.*), as well as the *London & North Western Ry.*, even in the case of tickets specially printed for children. Amongst present day Companies, the *London Midland & Scottish* and the *London & North Eastern* follow this practice.

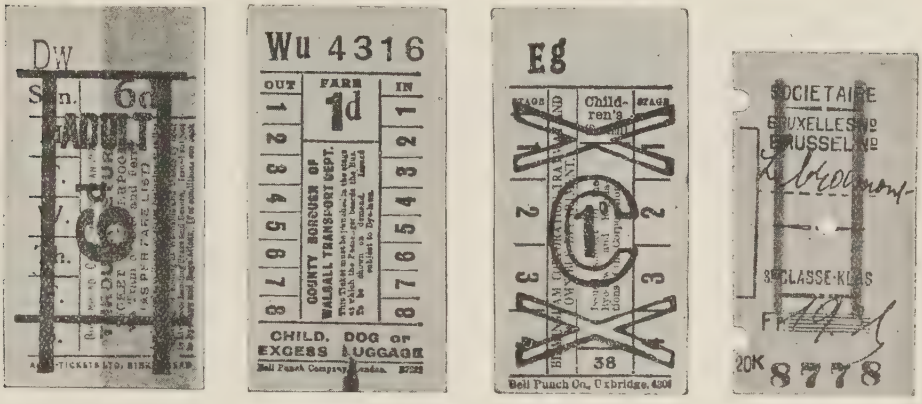
(2) In England, the *Lancashire & Yorkshire Ry.*, the *Wirral Ry.*, and the *Cheshire Lines Committee* formerly, as well as several Irish lines (the *Belfast & County Down Ry.*), and Scottish (the *Glasgow & South Western Ry.*), and the *Isle of Man Ry.*

(3) Certain Companies who divide up their ordinary tickets, used this method for return tickets (the *Great Northern Ry.*, the *North Eastern Ry.*, the *Cambrian Ry.*). Unlike other railways, which remove a triangle from the lower middle part of the ticket, the *Northern Counties Committee* of Ireland cut off the lower right hand corner.

(4) *The Paris Ceinture Ry.*

(5) On the *Barry Ry.* (Wales), a vertical band, 1 cm. (13/32 in.) wide on the left hand side of the ticket.

(6) *Great Western Ry.*, *Midland Ry.*, in England; *Great Southern Ry.*, in Eire.




Cheap tickets. (Scale 4/5.)

Fig. 924. — Through return ticket by boat, or bus and ferry. — Marked with the days of the week. — Category : adult. — *Birkenhead Corporation Transport.*

Fig. 925. — Soft cardboard ticket. — Category : child, dog or luggage. — List of sections in each direction. — *County Borough of Wallasay Transport Dept.*

Fig. 926. — Cheap child's ticket. — Surcharged with initial showing category. — No. of line and list of sections in each direction. — *Birmingham Corporation Tramways and Omnibus Dept.*

Fig. 927. — Edmonson ticket for member of a group. — Category : « Member of Society ». — *Belgian National Railways.*

only in the case of ordinary tickets at the usual rates, but also for a whole series of tickets at special rates, both single and return (Fig. 922).

ROAD FIRMS' TICKETS. — Special tickets for children are the exception. The fixed price tickets give a list of the longer journeys which children can make for the same fare; it then suffices to indicate by surcharging or punching whether the ticket is issued to an adult or a child (Fig. 924).

Rates for children sometimes only apply at certain hours of the day (Fig. 920). The same tickets are often issued for other categories of transport enjoying the same reduced rates, dogs or luggage for example (Fig. 925). The ticket is then punched to indicate the purpose for which it was issued.

## 4. — Restrictive reductions.

We have collected together under this heading various categories of reductions which only apply to a restricted number of passengers.

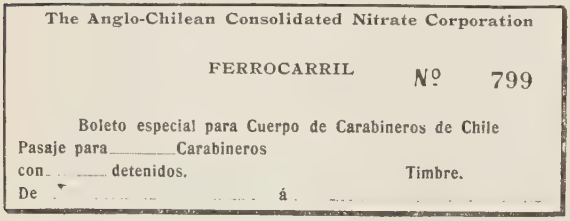
4. 1. — **Collective tickets** are issued for group journeys. The issue of such tickets often depends on a minimum number of passengers : 8 in Germany, 15 in Belgium (Fig. 927). In certain cases tickets are also issued for round numbers of passengere : 50 or 100 in the Argentine on the occasion of an Eucharistic Congress *(Fig. 293)*.

Certain american paper tickets are valid for any number of passenger belonging to a group, but it is necessary to indicate the number by punching to prevent others from profiting by this fraudulent-

ly. To enable this to be done, these tickets are numbered with a series of consecutive numbers, that applying being punched. It is also possible to punch figures from 0 to 9 in two columns, one representing units and the other tens, to enable the desired number to be made up.

Soldiers travelling in convoy with a single ticket indicating the number of men of each rank of which the convoy is composed also profit by special reductions, and also have special tickets (Fig. 928).

Certain collective English tickets issued during the 1914-1918 war added to these lists Red Cross staff, wounded and shipwrecked. In the East Indies, for


The Anglo-Chilean Consolidated Nitrate Corporation

FERROCARRIL Nº 799

Boleto especial para Cuerpo de Carabineros de Chile

Pasaje para ..... Carabineros

con ..... detenidos. Timbre.

De ..... á .....

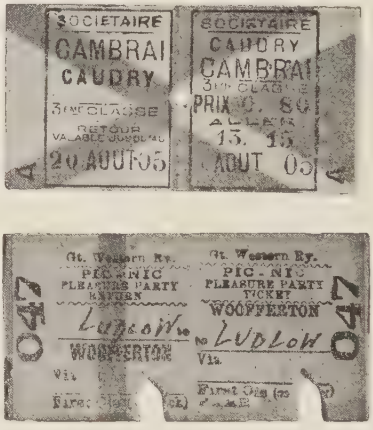
Fig. 928. — Collective free-pass paper ticket for soldiers of the police militia and prisoners. — *The Anglo-Chilean Consolidated Nitrate Corporation.* (Scale 4/5.)

funerals, the members of a family and other mourners are added.

The use of a travelling warrant or voucher has some drawbacks, however; it obliges the users to remain together, which is only necessary in the case of military convoys and certain other cases. For this reason, at the same time as many tokens as there are persons in the group can be issued, the warrant or voucher remaining in the hands of the person in charge of the group.

On the *Central Argentine Ry.*, the travelling warrant or voucher itself includes such tokens in the form of detachable coupons. Certain South African tokens carry the wording « one of a group of natives ».

In other places it is considered sufficient to issue the required number of tickets and no single ticket for the group is issued, whether completed by tokens or not. Each such ticket is marked with a distinctive sign, such as a star, which is the emblem chosen by the *International*







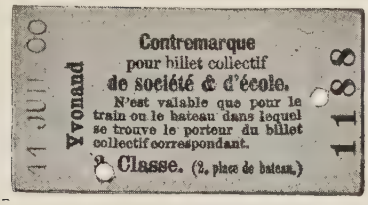
Tickets for members of groups. (Scale 4/5.)

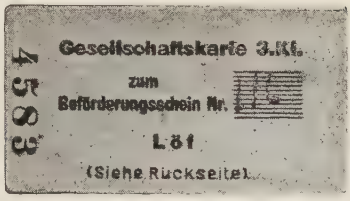
Fig. 929. — « Society member » return ticket with St. Andrew's Cross in different colours. — Given date. — *Nord Ry.*

Fig. 930. — Picnic pleasure party. — *Great Western Ry.*

*Union for the issue of Combinable coupon tickets.* It is also possible to issue tickets printed or surcharged with such words as « Congressiste » (1), « Convention » (2) or « Sociétaire » (3).

(1) Sleeping-cars Company.
(2) America.
(3) Belgium.




Tokens for group members. (Scale 4/5.)

Fig. 931. — Issued with collective ticket for a school or society. 3rd. class rail, 2nd. class boat. — *Swiss Federal Rys.*

Fig. 932. — Ticket of German type of the Montjoie line. — *Belgian National Rys.* — The number of the collective ticket is written in by hand.

The same is done in the case of booklets of detachable coupons *(Fig. 47)*. In Germany the number of the member of the society is added by hand on the voucher (Fig. 932); in other countries the vouchers may be completely printed already (Fig. 931).

In addition, in England, there are tickets for the members of certain special groups which constitute in this way as many different categories :

« Party » or « Pleasure party »;

« Theatrical or dramatic company »;

« Picnic pleasure party » (Fig. 930).

To complete these, tickets are even issued for :

« Attendant for organised parties ».

Mention may be made in passing of the travelling parties organised by travel agencies (See part G : « Ticket issuing entities ») as well as groups of scholars, etc. Special mention may also be made of sporting and open air associations, such as :

« Tramping tour » or « International tramping tour » (*L. N. E. Ry.*, etc.);

« Camping pleasure party ». The *Mersey Ry.* limits the issue of such tickets to persons under 16.

As a general rule the British Railways, and other railways too sometimes, issue single and return tickets at reduced rates to children forming part of a group.

In addition to such groups, to simplify the service, tickets valid for use by several persons are also issued. In Nigeria there are tickets printed for ten persons.

In other British Colonies, there are tickets for the use of a passenger or passengers, his servants, and a certain amount of luggage, all depending on his social position and the class of travel. For example :

1st. class, 3 servants and 250 kgr. (551 lb.) of luggage;

2nd. class, 1 servant and 100 kgr. (220 lb.) of luggage;

3rd. class, 0 servant and 50 kgr. (55 lb.) of luggage.

**4. 2. — Tickets for important events.** — Apart from excursion trains, special trains are run in connection with important events for which special tickets are issued, even if there is no reduction in the fares and the holders are travelling separately. It is important that each passenger should be able to find his seat easily on both the outward and return

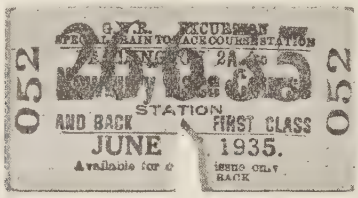
journey. For this reason the tickets are different from the ordinary tickets.

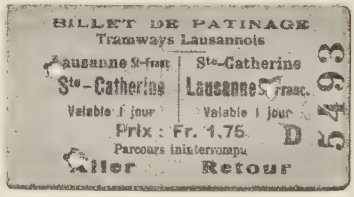
Very often each train or group of trains is marked with a distinctive sign which is reproduced on the tickets. This is a return to the system used on the *Barcelona Tramways (Fig. 494* to *497)*. Such railway tickets are surcharged with the date (Fig. 933), with various symbols or emblems *(Fig. 628)*. On the *P. O. Ry.*, stars, lozanges, etc., are used; on the *Nord Ry.* a locomotive, a horse's head, or other drawing is reproduced on each half of return tickets *(Figs. 498-499)*.

fares for all classes were increased on all the trains.

In Belgium, for important special events, Edmonson tickets of standard colour for each group of trains for the three classes are issued; they are surcharged with a large figure showing the class. This makes it possible to group the travellers in the trains of each class corresponding to the colour of their ticket.

Return tickets often include a coupon giving access to the racecourse or sports. Special single or return tickets are required for stations connected with race-




Tickets for sports meetings. (Scale 4/5.)

Fig. 933. — Race course service. — Return ticket to the special station. — Surcharged with the date. — Category : Excursion. — *Gt. Western Ry.*

Fig. 934. — Return skating ticket. — *Lausannois Tramways* (1902).

Tickets for large fetes or regional events, or those issued in connection with political events, carry no illustrations. On the other hand, English tickets issued in connection with sporting meetings are printed with a football and cricket gear *(Fig. 629)*.

CLASSES. — Certain sporting events, such as the Derby at Epsom, draw such large crowds that the *London Brighton & South Coast Ry.*'s tickets specified that the class of carriage could not be guaranteed *(Fig. 778)*. The Company profited as the last train for the races was made up entirely of first class stock, and the courses or special sports which are only used on the days when there are meetings *(Fig. 628)*.

FARES. — The Companies are frequently authorised to increase their rates for race trains, and the road companies do the same.

One Belgian Company introduced return tickets for such an occasion, for a curious motive. Having noticed that many of the passengers which it carried for 35 centimes to the race course at Boitsfort had to return on foot as they had spent all their money betting on the course, the Company thought it would be

as well to issue return tickets so as not to lose this additional traffic.

4. 3. — **Sporting tickets.** — In addition to tickets for large meetings, there are many special tickets in connection with races or other sporting meetings.

Individual tickets for race meetings. — Special tickets are issued for certain classes of passengers :

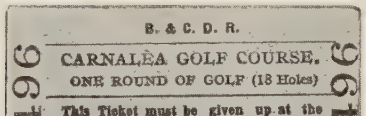
Race course staff;
Totalisor staff;
Racecourse betting control board (1);
Groom travelling with race horses.

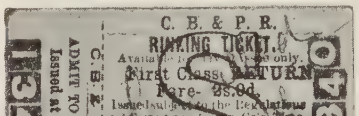
Tourists and hikers tickets. — As far back as 1895, the *London Metropolitan Ry.* introduced tickets for 15 circular journeys with a break for a section on foot (pedestrian tour). This idea was popular both in England (*Great Western* « walking tour ») and on the continent.

Scouts, children and adults also have special tickets.

The same applies to « tourists » in England *(Fig. 425)* and America. Those making long journeys to the Pacific, for example, are issued with tickets valid for 6, 9 or even 12 months.

Winter sports. — Many of the Swiss, Austrian and French mountain lines issue Sunday sports tickets, which are available for use on the first train for the outward journey, and on any train for the return journey. These are completed by special tickets for skis or bobsleighs (Fig. 939). Tickets are issued for « snow trains » pretty generally (Fig. 938). Both railways and tramways issue « skating tickets » (Figs. 936-937).





Tickets for sports meetings. (Scale 4/5.)

Fig. 935. — Golfer's ticket issued by the *Belfast & County Down Ry.*, to be exchanged on the golf course.

Fig. 936. — « Rinking ticket » with special coupon for admission to the rink. — Return. — *Cork, Bandon & Passage Ry.*

Fig. 937. — Skating ticket. — *Great North of Scotland Ry.*

(1) *Great Western Ry.*

VARIOUS SPORTS. — Mention may also be made of the following special tickets :

« Angler » for members of recognised clubs (1) ;

« Fishing and Yachting » (2) ;

« Golfer » (Fig. 935) ;

Caddies accompanying golfers;

« Rinking tickets » (3) (Fig. 936).

**Tickets sold in bulk and used singly.** — This category of ticket is sold to recognised clubs for the benefit of their members. They are also issued to :


Sports tickets. (Scale 4/5.)

Fig. 938. — Special snow train. — Date and time indicated. — Timetable on back. — *Austrian Federal Rys.*

Fig. 939. — Ski or bobsleigh ticket. — Grid for marking train. — Fixed route. — Destination in white letters on dark ground. — Same railway.

Congressionalists or members of American Conventions;

Members of Conferences (England) ;

Members of Societies (Belgium).

In some countries they are also issued to electors (4) (Fig. 941) and to those taking part in funerals (*Fig. 158-940*) (5).

Instead of issuing tickets each of which will be used by a different person, it is also possible to sell a packet of tickets which can be used in turn by the same person. Such for example are the bulk tickets in England, issued in particular to commercial travellers *(Fig. 304)*. « Bargain » or « discount » tickets are also sold in advance at a reduced price, just like all goods sold in bulk rather than separately *(Fig. 302)*. Finally, extending the same idea, some English Companies issue packets of tickets valid one on each day of the week *(Fig. 339)*.

**4. 4. — Tickets of a philanthropic nature.** — Under this heading can be grouped the following categories for which there are special tickets :

Nurses;

Members of the Red Cross;

Sister of Charity (Ireland, before 1914) ;

Ambulance (Figs. 943-944) ;

Military Hospital *(Fig. 897)*;

(1) *North Staffordshire Ry.*, a English Company. — *Newfoundland Ry.*

(2) *Great Eastern Ry.*

(3) *Chicago, Burlington & Quincy R. R.*

(4) Belgium; in England on the *South Devon Ry.*

(5) In Buenos Ayres, the *Chacarita Tramway* issued special tickets for the section to the necropolis (Fig. 940).

The *Southern Ry.* does likewise in the case of special trains from London to the necropolis at Brampton.

Convalescent Home, in England;
Invalids, cripples, ex-servicemen.

As well as tickets for priests and protestant ministers, in Scotland tickets are issued for :

« Sunday Church train » (1).

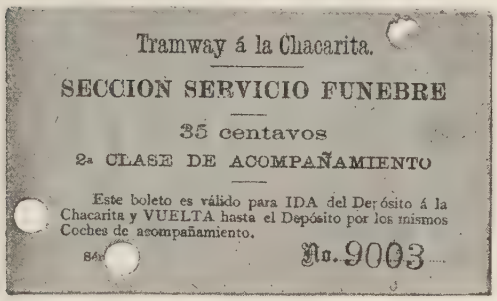



Fig. 940. — Ticket for section to the Necropolis. (Scale 4/5.) — Category : Member of funeral cortege. — *Chacarita Tramway.* Buenos Ayres.

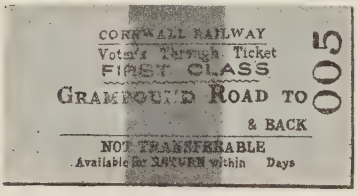
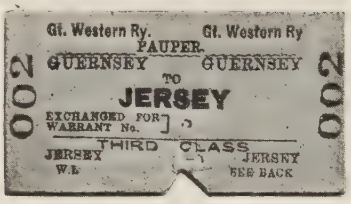
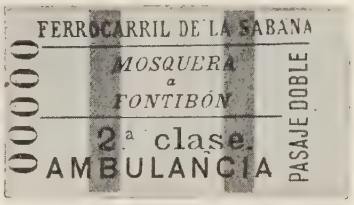



Fig. 941. — Voter's return ticket. (Scale 4/5.) — *Cornwall Ry.*

In many countries there are special tickets for pilgrims (2). In another range, there are tickets for :

Home seekers, in the United States *(Fig. 14)*;
Emigrants (Fig. 945);




Philanthropic tickets. (Scale 4/5.)

Fig. 942. — Pauper's ticket issued against requisition. — Inter-island. — *Gt. Western Ry.*

Fig. 943. — Ambulance return ticket, thin cardboard. — *Sabana F. C.*

Transmigrants (3);
Transbritain;
Foreign Emigrant;
Repatriation (Fig. 946*b*);
Pauper (Fig. 942).

TRAMWAY COMPANIES issue special tickets for :

Nurses;
Red Cross;
War Blind (Fig. 947);
Disabled (Brussels);
Visits to clinics (Fig. 946*a*);
Mutilated *(Fig. 896)*;
Mutual assistance (Rotterdam).

This is also a way of collecting funds

(1) *North British Railway.*

(2) In England, France, Belgium, Switzerland, Russia, as well as in the East Indies, the Far East, Japan and China.

(3) *Southern Railway.*


Fig. 944. — Ticket to inspect ambulance train during 1914-1918 war. (Scale 4/5.) — Coupons to be detached at the barrier and on the train. — Category : Staff. — *Gt. Western Ry.*

on certain special days, when tickets are issued for this purpose :

Day of the Two Crosses (Fig. 948*a*) ;

For the benefit of the Public Assistance Funds (Fig. 948*b*) ;

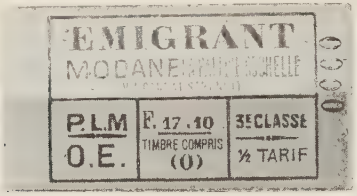



Fig. 945. — Emigrant's ticket. (Scale 4/5.) — Names of Companies on the left : *P. L. M.* and *Ouest-Etat.* — Half fare, in two colours.

4. 5. — **Tickets issued in connection with temporarily reduced fares.** — The most widespread of these are weekend tickets, the validity of which varies from one railway to another. (Figs. *265-817*). Certain companies, for example the *Great Western Ry.* also issue such tickets with varying validity :

FM (Friday to Monday) ;
ST (Saturday to Tuesday).

Weekend tickets are also issued for special classes of passengers :

« Commercial traveller » in Canada, on showing a certificate from the Commercial Travellers Association ;

« Company's employee » ;

« Child's Weekend ».

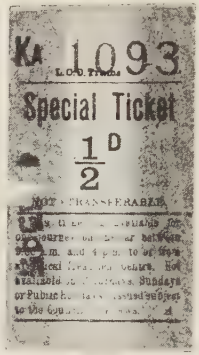




Fig. 946*a*. — Special thin cardboard ticket for visit to a clinic. — *London County Council Trams* (Scale 4/5).

Fig. 946*b*. — Edmonson repatriation tickets (Scale 4/5). — Issued by the *Belgian State Rys.* on the German model. — Vertical line indicating ticket available on all trains. — International Convention.

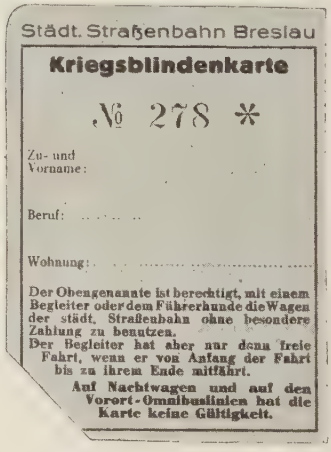
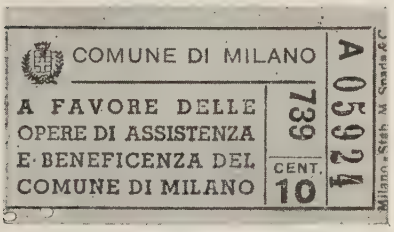



Fig. 947. — Paper ticket for war blinded. (Scale 3/4.) — *Breslau Municipal Tramways.*


*Milan Tramways* Tickets. (Scale 3/4.)

Fig. 948*a*. — Day of the two crosses.

Fig. 948*b*. — Tax ticket in aid of the Public Assistance funds.

Sunday tickets are issued fairly generally. Such tickets carry distinctive marks to distinguish them from ordinary tickets; in Germany for example they carry a blue band, one cm. wide, parallel to the long side *(Fig. 648)*.

It is a curious fact that whereas the railways grant reduced fares in the case of such tickets, many tramway companies increase their rates on such days. Their tickets show two values in such cases, one for weekdays, the other for Sundays *(Fig. 416)*.

There is an odd Sunday ticket in America (1) which gives the date of 24 consecutive Sundays on a scale, and can thus be used on any one of them.

Special excursion tickets of short validity are also issued on weekdays when it is wished to increase the traffic :

Saturday;
Saturday afternoon (2);
Thursday to Saturday (3);
Monday to Friday (2).

Tickets are also issued for longer periods :

« Long period tickets »;
« Summer tickets » *(Fig. 592)*;
Season tickets.

Tickets issued on the occasion of fetes or other special events on a given date must also be mentioned here. Special tickets are issued in particular for :

National holidays;
Religious Meetings;
Carnivals (4).

**4. 6. — Tickets for use on certain trains only.** — Special tickets are issued for certain trains where special rates apply. In the case of regular trains, special Edmonson tickets are used, only some of which are for reduced rates :

Suburban trains;
Light trains;

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(1) *Indianapolis Southern R. R.*

(2) *Great Northern Ry.*

(3) *Great Southern Ry.* Eire.

(4) National holiday, *Ceinture Ry.*
National fetes, religious fetes, carnival, *Argentine.*
Easter festivities, in the *East Indies.*
Kyaiktiyo Festival, *Birmans Railways.*

Economic trains (ticket *Fig. 803* and paper tickets *Fig. 306*);

Tramway trains *(Fig. 142)*;

Railcars.

Tickets are also issued for all kinds of special trains, the time-table of which is frequently given on the back of the ticket. There are many categories :

Special trains organised by papers or travel agencies;

Trains for theatregoers[1].

*Fig. 262* shows a ticket for the first train to be run to a destination unknown to the passenger. Such trains have been multiplied since then, under various names :

« Hikers Express » *(Fig. 262)*;

Surprise or mystery trains (*Figs. 266* and *267* — for tramways).

The running of sports trains (Fig. 939) has become too frequent for them to be included amongst special trains.

Light railway companies also run trains with special fares :

Market trains;

Trains with reduced fares;

Night trains at increased fares (see hereafter).

On tramway lines, such trains are single motor units, such as the « tourist cars » of Brighton (Fig. *883*), or the « special cars » of Newcastle.

There are special tickets for transfering from the tramway to the motor bus services or vice-versa (Fig. *849*), sometimes on payment of an additional fare, as well as for mixed journeys by road and rail. We have already dealt with such tickets.

**4. 7. — Various tickets.** — Under this heading we will group various categories of tickets which cannot be classed in any of the groups previously dealt with.

Mention must be made of tickets commemorating special events, which are chiefly issued for reasons of publicity :

an anniversary *(Fig. 630)*;

the opening of a new line *(Fig. 607)*;

a new method of traction *(Fig. 568)*;

a new express train.

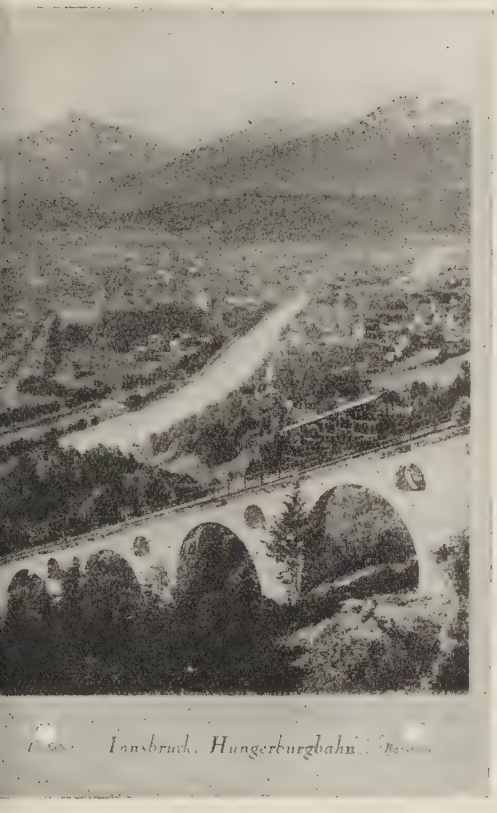
Souvenir tickets are often issued on such occasions, and are frequently of great artistic merit. In Japan they are printed in many colours (Tokio, Kobe); in the United States they usually consist of reproductions of views, while in Germany postcards have been used as tickets, on the back of which was printed the details concerning the journey (2) and two little spaces to be perforated, one on the outward, the other on the return run (Figs. 949 and 950).

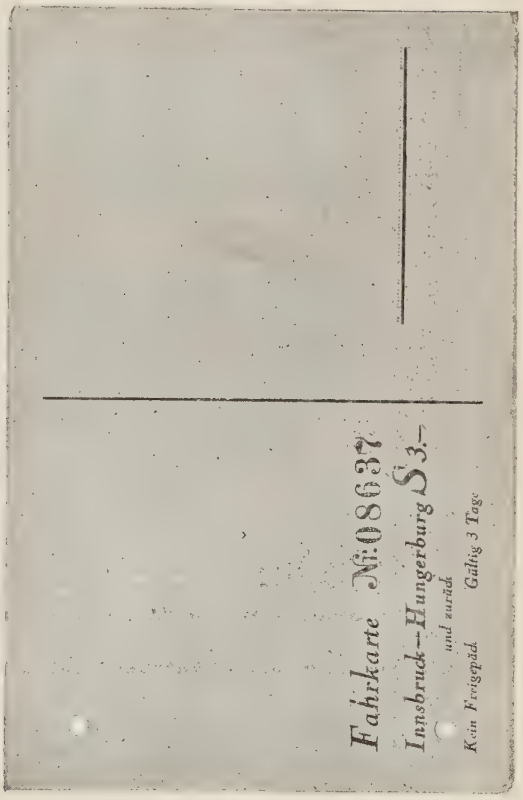
We ourselves have issued « psychological » tickets on an important Brazilian railway, which played upon everyone's latent instinct to profit by a good thing. These were reduced fares for certain

---

(1) Special trains for the Liedkatel.
Tombola du Theaterverein (Swiss Theatrical League).
Special cinema train *(Austrian Federal Rys.)*.

(2) On the *Innsbruck-Hungerburg Ry.*, for example, the serial number, the price, the period of validity (3 days), and whether with or without luggage.




Illustrated card — Souvenir ticket *Innsbruck-Hungerburgbahn.* (Scale 3/4.)

Fig. 949. — Back view and spaces to be perforated on the outward and return journeis.

Fig. 950. — Front giving price, number and period of validity.

trains, only available to passenger who were not entitled to any other reduction. To make sure that whole families would use them, the issue of such tickets was limited to two persons per family. Naturally the others who were not entitled to them took the greatest pains to get hold of such tickets, and these trains were the greatest success.

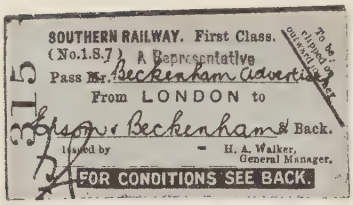
## CHAPTER XXV.

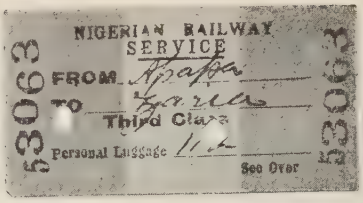
### Free tickets.

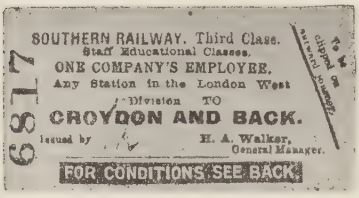
Free tickets are issued to the Company's employees travelling on the Company's business. Usually these are free passes on which the department to which the employee belongs is indicated.

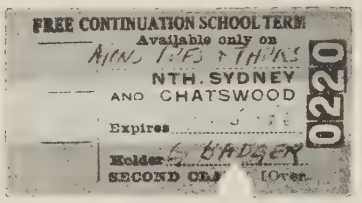
In certain cases preprinted Edmonson tickets are given to employees, for example to allow them to attend professional courses. Such return tickets are available from any station in the section to the place where the course is being held (Fig. 952).

Employees and their families are also given a certain number of free tickets a




Edmonson tickets. (Scale 4/5.)

Fig. 951. — Journalist's free pass. — Triangular space to be perforated on outward journey. — Warning notice in white letters on dark ground. — *Southern Ry.*

Fig. 952. — Free pass for employee of same Company.

Fig. 953. — Service pass with free transport of luggage. — *Nigerian Ry.*

Fig. 954. — Free pass for pupil of a professional school. — *New South Wales Govt. Rys.*

year, and sometimes tickets of special categories :

« Annual excursion »;

« Employee's pleasure party »;

« Seasonal employee's special round trip ticket »;

« Special excursion free pass » for employees of the Company, for example workmen from the Great Western Ry's Swindon shops.

When the railways are state owned, free transport is sometimes added to other privileges. For example in New South Wales students at the free professional schools can also get seasons of tickets for their journeys. These are always Edmonson tickets (Fig. 954).

Free transport is also given to certain persons entitled to it according to the railway regulations, such as post office staff *(Fig. 141)* or to other persons to whom the Company considers it desirable to grant such privileges. Though all such persons are habitually holders of permanent passes, they may be issued with special permits, such as those issued to journalists (Fig. 951), persons travelling with fruit or cattle who are of great assistance to the Company during the journey, or to agents accompanying groups of tourists.

For publicity reasons also free journeys are organised for certain persons fulfilling the requisite conditions *(Fig. 572)*.

In most cases such permits are free

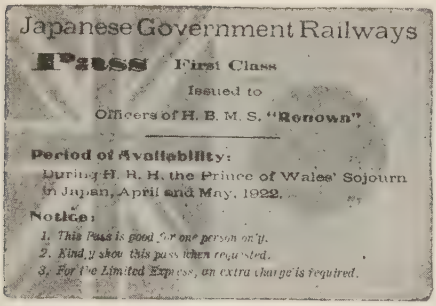



Fig. 955. — Free pass for officers of a visiting warship. — Illustrated with English flag in colours. — *Japanese State Rys.*

The first passes issued during the war were very simple (Fig. 956*b*). Any available paper was used and the permit became valid when it was stamped (Fig. 957).

Road firms issue similar tickets :

« Workman's ticket » London;

« Workingman's ticket » United States;

« Employee's pass » Birmingham.

Certain companies use different passes for the employees of different departments : traction, permanent way, etc.



Tickets reduced to 3/4 of their proper size.

Fig. 956*a*. — Paper service coupon for a single journey (1877). — *Belgian State Rys.*

Fig. 956*b*. — Ticket issued by the commander of a company in the Austro-Hungarian Army (1918).

passes. Tickets (*Fig. 171-954*) or cards are used when the demand warrants it (Fig. 958), but in the case of permits issued as an exception for various reasons, the usual practice is to use blank pads from which the sheets are detached as required *(Fig. 265)*.

Permits are also issued authorising the holder to travel on the engine (Fig. 960).

In many countries free passes are liable to stamp duties.


Fig. 957. — Ticket issued in Liège by the commander of the Army of occupation (1914).




Tickets reduced to 3/4 of their proper size.

Fig. 958. — Messageries Nationales free pass. — Omnibus service, Paris, 1875.

Fig. 959. — Permit for Company's employee. — *Bradford Corporation Passenger Transport Department.*

Fig. 960. — Permit to travel on the engine. — Safety background, coat of arms, and drawing (which has been brought out). — *Rumanian State Rys.*

## CHAPTER XXVI.

### Increased fares.

*a*) A change in the rates does not necessarily mean that the company has to print new tickets; it can alter the price of those already in use by surcharging them with the new fares or a conventional sign. When tickets for fixed journeys are printed at the moment of issue, it becomes necessary to change some or all the plates in certain machines (1). This is not a temporary measure like the former.

*b*) There are certain higher fares than the usual fares; these apply above all on

(1) See *Bulletin* for November 1938, p. 1123.


Tickets for various classes of trains. (Scale 4/5.)

Fig. 961. — Stopping trains, *Demerara Ry.*, British Guiana.

Fig. 962. — Seasonal express. — Dated by perforation. — *Sudan Govt. Rys.*

Fig. 963. — Limited « Mail ». — Date stamped. — *Midland Gt. Western Ry.*, Eire.

Fig. 964. — Boat express. — *Southern Ry.*

express trains which cost more to operate than the slow trains.

For a long time all the railways companies had two classes of trains like this and two scales of fares for which different tickets were issued, both single and return tickets, without counting certain specially privileged classes of passengers. *(Figs. 444-78)*. Passengers travelling at reduced rates were usually allowed on the fast trains only to a certain extent.

The *Midland Ry.* in England was the first to abolish the distinction between fares on the fast and ordinary trains, but the practice continued elsewhere and only gradually died out (1). It still continues on certain railways. In England the *Southern Ry.* is the only one to continue the practice in the case of the boat trains, to make sure they are not overcrowded. It should however be possible to ensure this, as in France, by simple regulations forbidding passengers to travel in such trains unless certain conditions are fulfilled.

In certain countries special tickets at the full rate or reduced rates were issued for certain categories of express trains :

« Express » (Figs. *545*-965-967) ;
« Mixed express » ;
« Limited mail » in Ireland (Fig. 963) ;
« Mail train » in the East Indies.

(1) While these rates were done away for the express trains in general, higher fares were in force on certain trains such as the « Flying Dutchman » and the « Zulu » of the *Great Western Ry.* until 1885, as well as the Scottish express and Irish mail trains of the *London & North Western Ry.* until 1898.

Mixed for journey partly by mail train and partly by ordinary train in the East Indies, similar to the Rumanian « Combinado ».

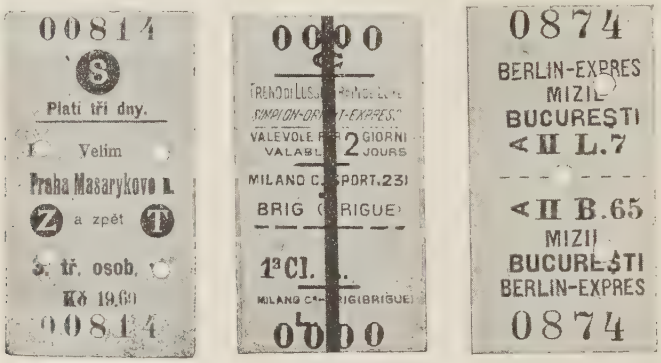
This led to certain curious anomalies, for example while holders of ordinary single tickets in each class or 1st. or 2nd. class return tickets were admitted to the mail train, holders of 3rd. class return tickets had to pay extra.

Cheap tickets were only available on the important trains in exceptional cases, when the fact was mentioned :

« Cheap ticket for fast train ».

The practice became general about 1895 in England and 1930 in Ireland. In many countries, however, the distinction between express and ordinary fares (*Fig. 444* on the one hand and 78 and 961 on the other) continued for a long time. Special fares are still charged on certain express or luxury trains (1) such as :

The seasonal express trains of Egypt and the Sudan (Fig. 962) ;




Tickets for express trains. (Scale 4/5.)

Fig. 965. — Return ticket. — Initial letters in white on dark ground. — *Czechoslovakian State Rys.*

Fig. 966*a*. — Ticket for the luxury train « Orient Express ». — Available on all trains. — International Convention. — *Italian State Rys.*

Fig. 966*b*. — Ticket for the « Berlin Express » (1906). — Separate notice of the monetary unit and the fare. — *Rumanian State Rys.*

The English boat trains (Fig. 964) ;

Luxury trains (Figs. 966*a* and *b*) ;

The American « extra fare trains » (Figs. 968 and 969) (the latter illustrated).

Finally higher fares are charged on many railcar services. In some countries there are several scales of fares on railcars, for example in Italy and France

(1) In Turkey, Rumania and Bulgaria, tickets are issued at special fares for the luxury train « Orient-Express » and, formerly for the « Berlin-Express » train.

It is done similarly in Egypt for the winter express trains.

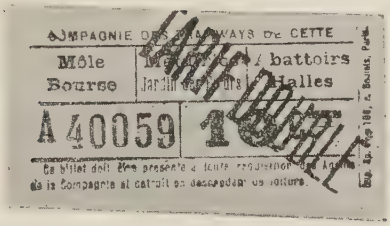
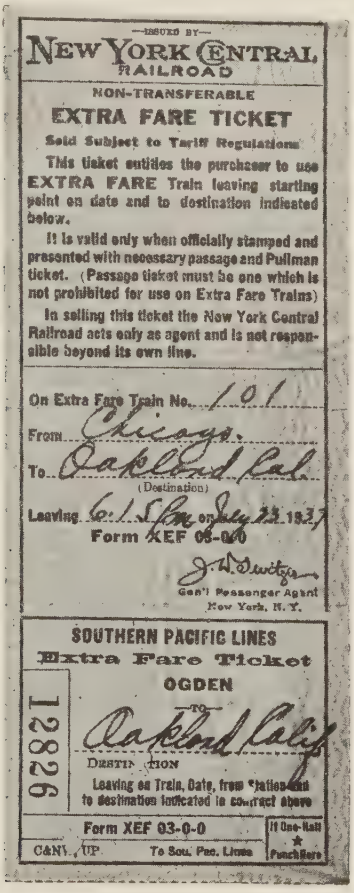



Fig. 967. — Theatre service at double rates. — *Cette Tramways.*

there are different fares on express and through railcars.

ROAD FIRMS frequently charge higher fares on trains or cars giving night services or on their theatre services; originally double fares were charged in these cases. Surcharged tickets were issued, two normal tickets thus equaling





Tickets of the *New York Central R. R.* for trains with higher fares. (Scale 3/4.)

Fig. 968. — Extra fare ticket. — Space « for 1/2 price » to be perforated.

Fig. 969. — Illustrated ticket for the « Twentieth Century Ltd. ». Extra fare and passage ticket. — No refund if the train is late.

one double fare ticket, or else « theatre » or « night » tickets were specially printed (1).

Such firms also frequently increase their fares on Sundays and holidays, as well as for race meetings. In addition to special tickets, use is made of tickets showing two values, one for ordinary use, the other for the higher fares *(Fig. 476)*.

(1) In Liège there used to be three scales of fares : ordinary fares between 7 a. m. and 9 p. m., half price before 7 in the morning, and double after 9 at night.

*(To be continued.)*

[ 625. 231 (.44) & 625. 232 (.44) ]

# New all metal coaches for express services of the French National Railways,

by Mr. FORESTIER,

Honorary Chief Engineer of the « Société Nationale des Chemins de fer Français ».

*(Revue Générale des Chemins de Fer.)*

It is proposed in the near future by the S. N. C. F. (French National Railways) to entrust the construction of an important order for all-metal coaches and vans to private builders as part of their post-war programme.

It is intended in this article to enumerate the principles on which the metal framework is designed, and to show the advantages obtained by the adoption of this method from the point of view of safety, as well as from the standpoint of economy of material.

The bogie vehicles are of two classes : one termed coaches for long-distance services, which are intended to be used on future long-distance high speed trains. The other class, termed branch line coaches, are to be used on lines and services of secondary importance, whereon they will gradually replace existing stock which has reached the limit of its useful life.

The diagrams (Figs. 1 to 5) give the main dimensions and interior arrangements of the coaches and vans, both four-wheeled and bogie.

## FIRST PART.

### I. — General constructional principles.

Since all-metal railway carriage construction has been used for more than twenty years both in France and in other countries, the author feels that he is in a position to express a considered, unbiassed opinion on the various trends in construction. At the moment, it is practically impossible to foresee with any degree of accuracy any additions to the author's present views on the subject, due to the impossibility of foreseeing what influence recent laboratory research work on the utilisation of special materials may have on the methods of construction. It is therefore felt that, for the present and for some long time ahead, the all-tubular style of construction first practised by the Experimental Department of the old Est Company about 1929, and subsequently followed up by further research work on the part of the S. N. C. F., is and will be the only possible method of reconciling the two opposing factors of maximum economy in the use of materials and maximum safety.

In order to enable a clear and complete grasp to be obtained of the delicate question of utilisation of materials, strongly dominated as it is by the two opposing principles stated above, it is proposed to sketch briefly and broadly the main trends in the evolution of the technique of construction of all-metal coaches during the last few years, with special reference to European practice. For further details, the interested reader is referred to the author's previous articles on the subject in the January, 1930, and August, 1936, numbers of the « Revue Générale des Chemins de fer », as well as to the Proceedings of the Conference at the Centre for Higher Study and Research in Transportation held in May, 1944.

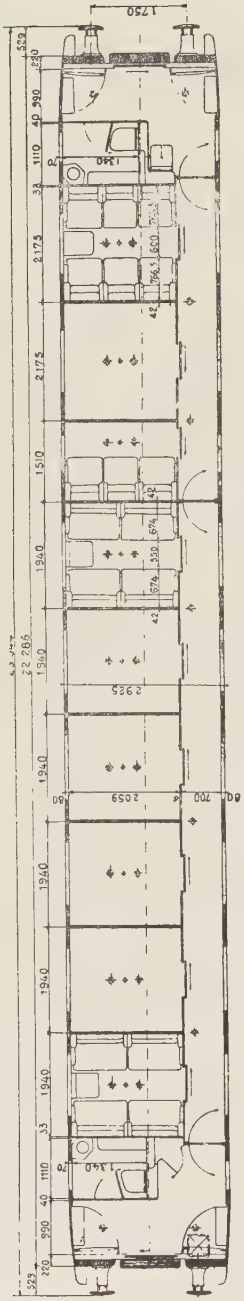


Fig. 1. — Carriage type A 2 1/2 B 6 myfi.

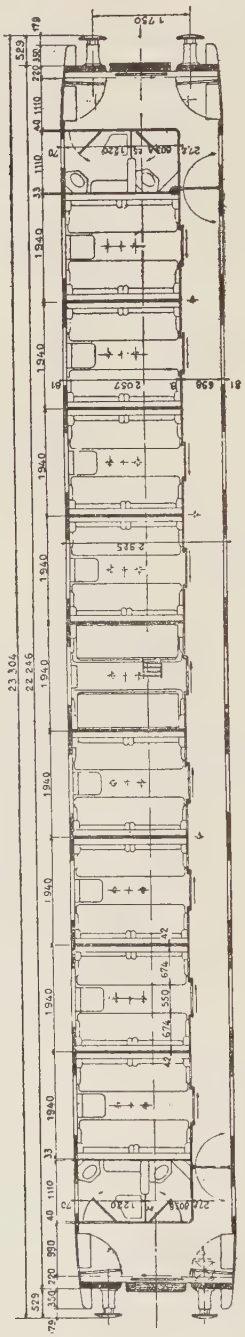


Fig. 2. — Carriage type B⁹ C⁹ myfi.

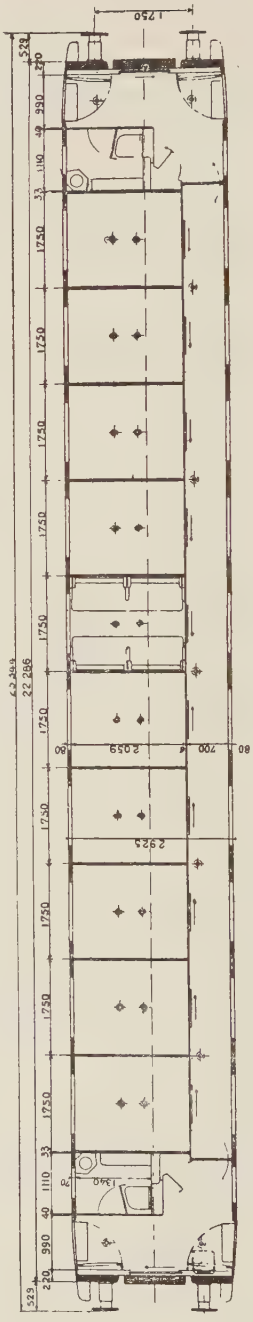


Fig. 3. — Carriage type C¹⁰ myfi.

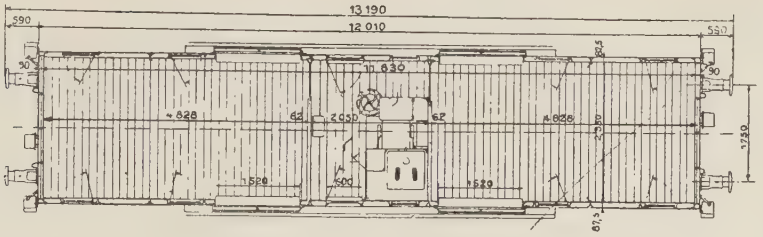



Fig. 4. — Van type Dq.

For about 40 years in America (1) and for about 20 years in Europe, no other system of vehicle construction could possibly be imagined save that used in the construction of iron and steel bridges.

From the theoretical standpoint, the body was composed essentially of a Vierendeel girder with two sides designed and calculated entirely from the point of view of their resistance to vertical loads (tare and pay loads). The underframe was designed to resist in practice only accidental shocks or forces especially at the ends. The roof was considered purely as a covering, playing only a minor part and additional to the resistance of the body.

In this american-inspired method, which afterwards was generally adopted in Germany, Central Europe and France (O. C. E. M. method of construction), no particular importance was placed on the strength of the fastenings of the various parts of the structure (underframes, partitions, sides and roofs). Most of these parts were fastened together by single riveting, rarely double, and the very great liability to failure of this method of fastening was entirely overlooked.

Here may be found the reason why accidents due to derailments and collisions, both in Europe and America, were of so serious a nature, and caused so much surprise at the time. It was noticed that the side sheets were torn away and then driven back (with consequent breaking up of the body and telescoping), the sheets contracting along the line of riveting, after the manner of cloth when the seams give way. (Fig. 6.)

As a result, the basic elements of all-metal construction were evolved, namely, sturdy cross-sections and sheets of a sufficient thickness.

The immediate consequence was an increase in tare weight. The very limited resistance to buckling of the various

(1) The adoption in America of the « built-up » under-frame termed « herring-bone » framing in no way affects the conclusions which follow.

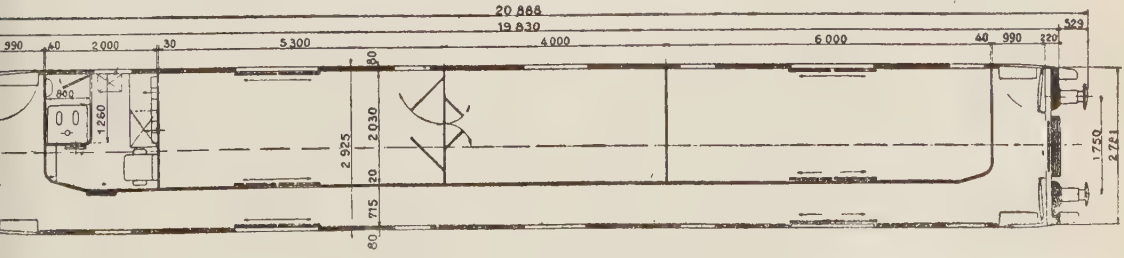



Fig. 5. — Van type Dd² yi.

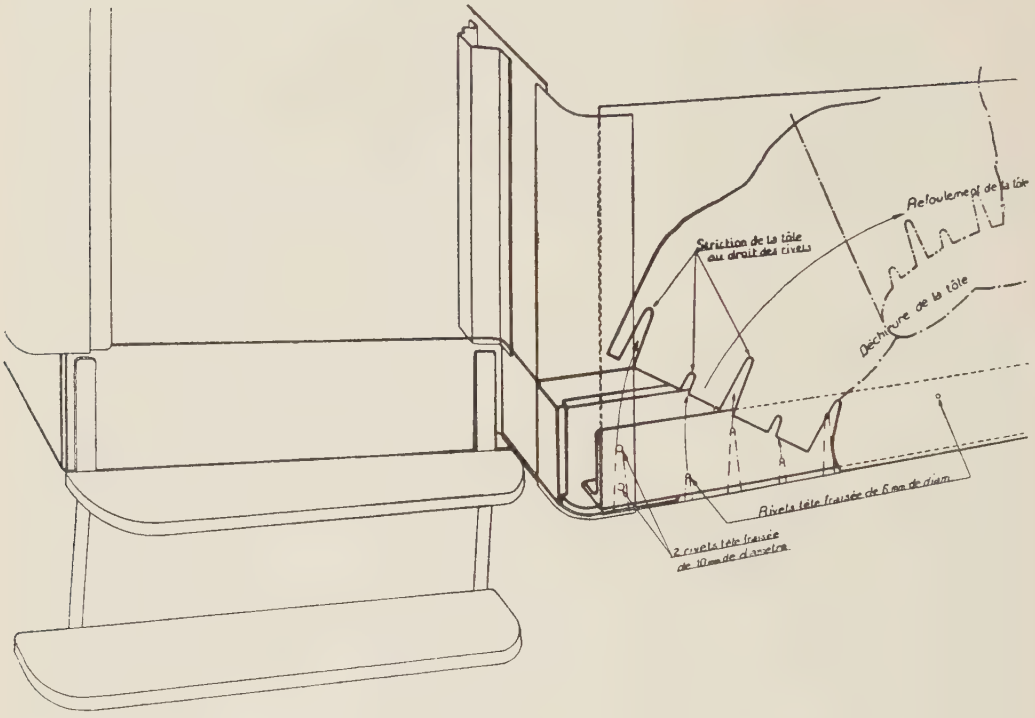



Fig. 6. — Illustration of tearing apart of a riveted assembly.

members of the structure, the non-reinforced plates, the necessity for using hot rivets on the thick sections and large surfaces, all tended to the use of commercial steels of strong and durable properties, whose relatively high weight, a matter of no account in the construction of buildings and bridges, imposed a very serious and vexatious handicap on rolling stock.

It was during this period in France (1926-27) that, as a result of observations made regarding the first riveted vehicles (whose tare weights of 45 to 50 tonnes [44.289 to 45.21 Engl. tons] were alarming, and whose weakness of fastenings of the various members would have proved to be a source of great danger in the event of an accident), coupled with the notable success that followed the introduction of pressed steel bodies in the automobile world, that the Research Departments of the various French Railway Divisions, the Nord, the Est, and, finally, that of the Ouest in collaboration with the « Société Industrielle Charentaise » tended to make almost general use of pressed and welded construction.

When this policy was first introduced safety was the paramount consideration, and the Research Departments did not foresee the full possibilities of reduction in tare weights.

Furthermore, the knowledge and experience of the necessary pressing and welding operations on the part of railway rolling stock builders did not yet permit of the introduction of methods in which everything was sacrificed on the altar of lightness of weight. The first vehi-

cles built for the Nord System had a tare weight of 50-52 tonnes (49.21 to 51.178 Engl. tons) (1), whilst those of the Est System started off with a weight of 41.2 tonnes (40.549 Engl. tons) in the case of the $B^4Dyi$ vehicles, and later attained their maximum of 48-49 tonnes (47.241 to 48.226 Engl. tons). This latter weight was due to the difficulties encountered during construction, as well as the paramount necessity for safety, coupled with a desire to obtain a lengthy resistance to the effects of corrosion by the use of ordinary mild steels.

However, the lessons learnt by the Research Departments and the experience gained during construction at last enabled decisive results to be achieved during the years 1935 to 1938. During this period the new light weight suburban coaches of the Est System were produced with a tare of 31 to 32 tonnes (30.510 to 31.494 Engl. tons), as compared with previous weights of 41.5 to 43 tonnes (40.844 to 42.320 Engl. tons). Main line stock of a tare of 35-36.5 tonnes (34.447-35.923 Engl. tons) replaced O. C. E. M. vehicles of a tare of 45-50 tonnes (44.289-49.210 Engl. tons) on the Ouest System, then the main line vehicles of the Est System were scaled down from 49 tonnes (48.226 Engl. tons) to 39 or 40 tonnes (38.384 or 39.368 Engl. tons), and, finally, the $C^{10}$ vehicles of the O. C. E. M. were produced with a tare of only 41 tonnes (40.352 Engl. tons).

Despite these considerable reductions in weight, a greater security was attained, the importance of which immediately placed these vehicles in a class by themselves as compared with those of the older riveted form of construction.

This progress was mainly due to a realisation of the fact that welding provided an absolutely secure method of fastening the edges of the plates either to each other or to the carlines and other members composing the underframes and bodies.

Thus, in the event of a collision occurring, the shock thereof was not absorbed in stages by successive stoppages and further tearing and bursting of riveted structures, but by a compact unit capable of offering resistance either to tension or to compression. The plates could then fulfil their true function of resisting shear stresses without their « seams » failing as a result of premature breakage.

All this was observed and realised by the Est System, and further developed by later research work on the part of the S. N. C. F. and carried out by the following methods :

— construction of a « one-piece » underframe by fastening the flooring to all the components of the underframe. This was a new departure at the time of its introduction;

— formation of a truly tubular girder by a firm and secure union of the underframe, body and roof into one homogeneous unit. Other forms of construction, altough passing under this name, were in effect nothing but an open section;

— introduction of a second framework to support the upper interior of the body, intended to prevent bursting of the body in case of telescoping;

— use of hollow members built up of thin sheets of high moment of inertia, offering a high resistance to buckling for anti-shock portions of the underframes and body ends, as well as for the interior members of the tubular body;

— continuous re-inforcement of the flooring, sides and roof thereby endowing them all with similar qualities to resist compression, in such a manner as to assure a quasi-isotropism of the tube section — a condition of its optimum utilisation. (The re-inforcing rings of the tubular construction as mentioned

(1) At this period a standard american coach weighed from 80 to 83 tonnes (78.736 to 81.689 Engl. tons).

above, incidentally, also reduce to a minimum the duration of the stresses which cause buckling. This is most essential in cases of accident.)

Such was the state of affairs in 1938 when it was decided to investigate a proposed 5-year plan for S. N. C. F. rolling stock.

The solution of the problem of reduction in weight was diligently pursued by making the fullest possible use of the principles previously laid down, and which appeared to provide a solid foundation on which the work of investigation and progress in weight reduction could be built up. Thus a more rational use of certain main members of the structure, a greater employment of semi-hard steels having a resistance of 65-70 Kgr. (143.300-154.323 lb.), and important developments in the use of light metals (alloys of aluminium and magnesium) in the construction of certain trimmings and other minor parts, either interior or exterior, which do not play a part in resisting stresses, all tended to a notable reduction in the tare, without in any way sacrificing either security or comfort.

Similarly, certain reductions were achieved in the design of the bogies, whose frames, previously made of steel and weighing 1 100 Kgr. (2 425 lb.), were now reduced to 550 Kgr. (1 212.5 lb.) by the adoption of welded plates and the application of the hollow unit principle.

In consequence, it will be possible to reduce the tare of future carriages down to 32-33 tonnes (31.496-32.478 Engl. tons) in the case of coaches of type $C^{10}$ and 34-35 tonnes (33.463-34.447 Engl. tons) for upholstered vehicles (1st. and 2nd. Class and 2nd. Class sleepers).

To-day, French rolling stock undoubtedly leads the world in respect of strength and minimum tare weight. A standard German coach weighs 41 tonnes (40.352 Engl. tons), with one compartment less and is of less robust construction, whilst the recent German super-lightweight coaches of an equal capacity and a tare of 28 tonnes (27.557 Engl. tons) represent an extreme reduction in weight only justified by a rigid wartime limitation in the amount of metal used. The price of this reduction in weight is a grave diminution in safety.

## II. — Application of the principles.

### Main characteristics of construction as used in the building of new coaching stock.

Considerations of space in this article only allow of a brief treatment of the most characteristics features of construction employed in the new coaches.

*Main line stock.* — These coaches are illustrated in Fig. 7. They are stream-

Fig. 7. — Main line carriage. Outside view.

lined, a result of elimination of projections and tapering the ends and sides. Details of their construction are shown in Figs. 8 to 11.

The following items are worthy of note in Figs. 8 to 11 :

— the greater use made of buffer trimmers of a box shape and their light weight, due to the fact that they are made of semi-hard steel plating of only 5 mm. (13/64 in.) gauge; the cross-members having a high moment of inertia; the continuity of the framing at the entrances achieved by dropping the underframe, as shown in Figs. 8 and 9;

— the continuity of the interior supports and extended connections of the body, particularly those at floor level and at the base of the roof. The roof longitudinals correspond to those of the underframe, and the partitions are reinforced by circular rings and tubular ends, which only require 14 Kgr. (30.864 lb.) of metal (a significant example of weight reduction).

The bogies have also been improved, and important reductions in weight from 6 400 Kgr. (14 109.6 lb.) to 4 900 Kgr. (10 802.6 lb.) have been achieved; 6 400 Kgr. represents the average weight

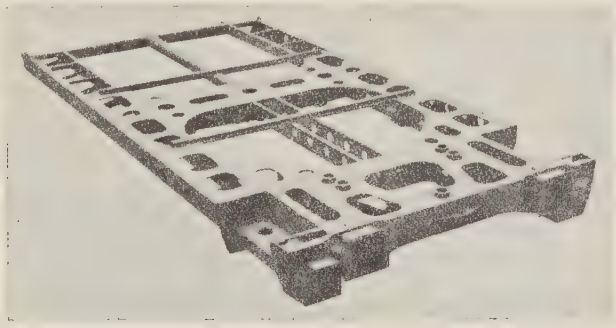


Fig. 8. — Reinforcement of the ends of the underframing of a main line carriage underframe. Plan view from above.

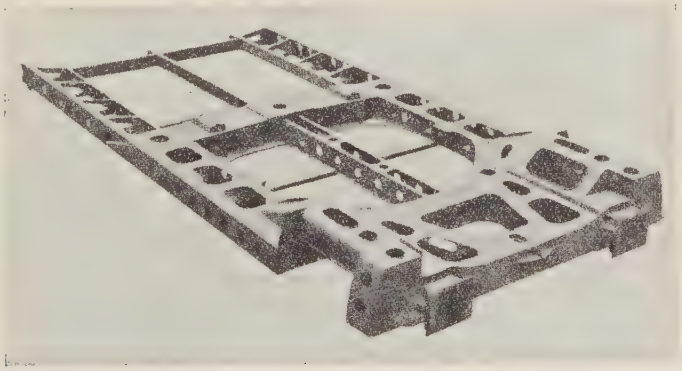


Fig. 9. — Reinforcement of the ends of the underframing of a main line carriage underframe. Plan view from below.

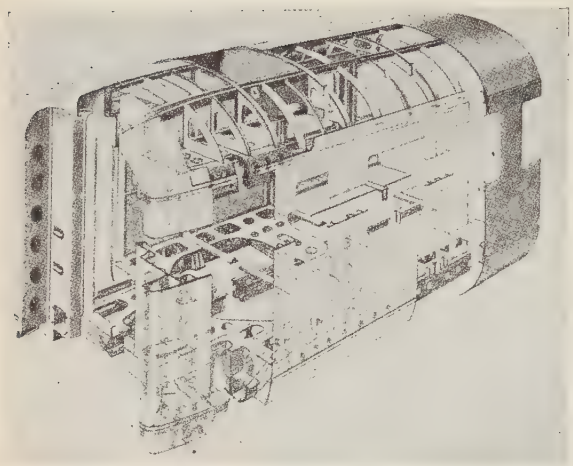


Fig. 10. — Framework for body of a main line carriage.

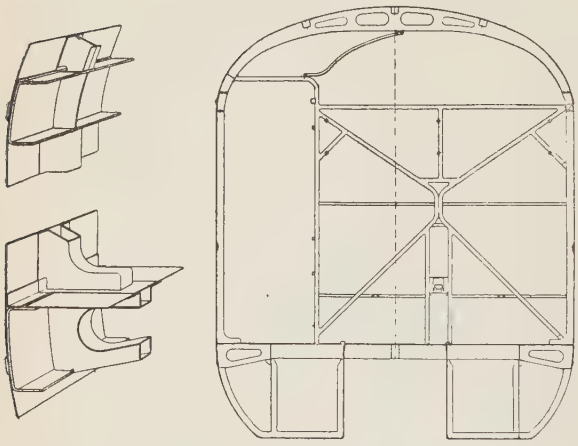


Fig. 11. — Cross-section through tubular framework of a main line carriage, showing tubular partition.

of a bogie of an early all-metal coach (Fig. 13).

It is not intended at this juncture to enlarge upon the reasons which led to the retention of the Pennsylvania type of bogie, except to state that this type has been found the most satisfactory at all speeds, not only from the standpoint of stability and comfort but also for economy in construction and subsequent maintenance.

It is important to note that this reduction in weight of vehicles has permitted the substitution of a light-weight axle box of type U 1. (either of roller, Isothermal or built-up construction) in place of the heavy and cumbersome type U 2. box. The U 1. is of moderate dimensions, yet it ensures good riding at speeds up to 150 Km./h. (93.2058 miles per hour). As an interesting consequence, the carriage wheel of type U 2., which presented such difficulties in the fitting of the tyres, has been straightened out, so that the disc is set perpendicular to the axle, similar to the type U 1. box used on freight wagons.

As an experiment, a certain number of bogies have been fitted with hollow forged axles, which results in a reduction of approximately 500 Kgr. (1 102.31 lb.) in the tare of each vehicle. The remainder have been equipped with hollow drilled axles.

As far as the interior fittings and general comfort are concerned, we would point out the extensive use of light alloys (this also applies to external fittings such as communication gangways), the insulating and anti-vibrational floors of poplar wood, separated from the flock-coated metal flooring by an air space, and carried on wooden supports with an intermediate layer of asphalte; the double partitions of the compartments insulated with felt or some other form of insulant.

— It is particularly desired to draw attention to the seats, which weigh only 30 Kgr. (66.1386 lb.) each in the first class compartments and 14 Kgr. (30.864 lb.) in the third class compartments.

Second class seats in the past have always suffered as a result of the necessity for keeping down the width of the compartment, but they have now been greatly improved. The third class seats also

show considerable improvement, particularly in latter years, and afford proof of a genuine interest in the comfort of the passengers on the part of the Railway Systems.

— Mention must also be made of the electric lighting system and the pressurised air heating system. This has added 3 300 Kgr. (7 054.8 lb.) of sundry material to the tare of each vehicle, despite a maximum use of light-weight materials.

A few further examples of interesting weight reductions and simplifications will now be given.

have resulted from the adoption of these measures, the resultant reductions in weight are worthy of notice. The tare of a type $C^{10}$ coach built in the year 1938 is 37 tonnes (36.415 Engl. tons) and that of a $C^{10}$ coach of 1944 is 32 tonnes (30.510 Engl. tons). This represents a dead weight of 400 Kgr. (881.848 lb.) per passenger, and is lower than the corresponding figure for a wooden coach. A similar figure for an all-metal type $C^{10}$ coach of 50 tonnes (49.210 Engl. tons) built during the years 1930-1935 was 625 Kgr. (1 377.88 lb.).

Fig. 12. — Branch line carriage. Outside view.

— The new consolidated brake gear with the cylinder, reservoir and fulcrum of the brake rigging united in one light and simple welded unit (representing a reduction in weight of 90 Kgr. [198.416 lb.]).

— The dynamo pulley made of magnesium alloy of 25 Kgr. (55.116 lb.) replacing a cast steel pulley of 75 Kgr. (165.347 lb.).

— The accumulator boxes for the lighting system, which usually weigh 50 Kgr. (110.231 lb.) and 20 Kgr. (44.092 lb.), now reduced to 19 Kgr. (41.887 lb.) and 7.5 Kgr. (16.534 lb.) respectively.

— The compartment doors made of aluminium on the Faively principle, without riveting or welding, and which weigh far less than ordinary steel doors.

Apart from the simplification of building and subsequent maintenance which

A summary of these savings in weight is given in the table on pages 298-299.

*Branch line coaches.* — The new stock for branch line services (tare 29 tonnes [28.542 Engl. tons] without electric heaters) will be constructed mutatis mutandis in accordance with the principles employed in the building of the main line vehicles (Fig. 12).

*Super light-weight bogies.* — In order to ascertain the absolute limits to which reduction in weight could be carried, an entirely new type of bogie was designed weighing 4 350 Kgr. (9 590 lb.), the adoption of which would result in a reduction of the tare of 1 tonne (0.9842 Engl. ton). The essential feature of this bogie is the separation of the functions of suspension and shock absorption. Suspension is carried out entirely

| Weights of main lines carriages under consideration. | | | Type 1938 Detailed weights. | | | |
|---|---|---|---|---|---|---|
| | | | Kgr. | | lb. | |
| FRAMEWORK OF BODY UNDERFRAME. | Underframe | | 4 285 | 9 510 | 9 447 | 20 |
| | Body | | 5 225 | | 11 519 | |
| INTERIOR AND EXTERIOR FITTINGS AND ACCESSORIES. | Streamlining | | | | | |
| | Draw and buffing gear | | | 1 810 | | 3 |
| | Underframe fittings | | | 360 | | |
| | Air brake gear | | 705 | | 1 554 | |
| | Hand brake gear | | 130 | 870 | 286 | 1 |
| | Pneumatic alarm signal gear | | 35 | | 78 | |
| | Electric lighting | | | 1 150 | | 2 |
| | Electro-steam heating system | | | 1 820 | | 4 |
| | Longitudinal partitions and corridor doors | | 2 588 | | 5 705 | |
| | Cross partitions and trimmings | | 1 100 | | 2 425 | |
| | Luggage-rack | | 200 | | 440 | |
| | Window lights | | 462 | | 1 018 | |
| | Window lifting and counterbalancing gear | | 450 | 8 140 | 993 | 17 |
| | Outer doors complete | | 120 | | 265 | |
| | Floors | | 1 110 | | 2 447 | |
| | Seats | | 1 670 | | 3 682 | |
| | Lavatories and fittings | | 440 | | 970 | |
| | Communicating gangways and vestibule gear | | | 260 | | |
| | Outside fittings | | | 70 | | |
| | Insulating, and noise reduction material, paintwork, etc. | | | 1 530 | | 3 |
| | TOTAL FOR BODY AND UNDERFRAME | | | 25 520 | | 56 |
| BOGIES. | Framework | | | 1 429 | | 3 |
| | Running gear | Wheels and axles | | 4 690 | | 10 |
| | | Oil boxes | | 715 | | 1 |
| | Suspension gear | Swing links | | 1 284 | | 2 |
| | | Cross bolsters | | 505 | | 1 |
| | | Sundry secondary suspension gear. | | 837 | | 1 |
| | | Suspension springs | | 1 123 | | 2 |
| | Brake gear | Rigging | | 824 | | 1 |
| | TOTAL FOR BOGIES | | | 11 407 | | 25 |
| | TOTAL TARE WEIGHT | | | 36 927 | | 81 |
| | | i. e. | | 37 t. | | 36.415 Engl. |

NOTE. — It will be seen from this table that the weight of the metal framework of the body and the underf

| Type 1944 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Detailed weights. | | | | Decrease. | | Increase. | |
| Kgr. | | lb. | | Kgr. | lb. | Kgr. | lb. |
| 8 100 | | 7 650<br>10 207 | 17 857 | 1 410 | 3 108 | | |
| 520 | | | 1 146 | | | 520 | 1 146 |
| 1 140 | | | 2 513 | 670 | 1 477 | | |
| 230 | | | 507 | 130 | 286 | | |
| 820 | | 1 499<br>210<br>99 | 1 808 | 50 | 110 | | |
| 1 650 | | | 3 638 | | | 500 | 1 101 |
| 1 650 | | | 3 638 | 170 | 375 | | |
| 6 490 | | 4 604<br>2 271<br>440<br>806<br>736<br>313<br>1 985<br>2 469<br>683 | 14 307 | 1 650 | 3 638 | | |
| 260 | | | 573 | | | | |
| 70 | | | 154 | | | | |
| 1 220 | | | 2 691 | 310 | 683 | | |
| | | | | 4 390 | 9 677 | 1 020 | 2 247 |
| 22 150 | | | 48 832 | 3 370 | 7 430 | | |
| 1 215 | | | 2 679 | 214 | 472 | | |
| 4 019 | | | 8 860 | 671 | 1 479 | | |
| 544 | | | 1 199 | 171 | 377 | | |
| 940 | | | 2 072 | 344 | 758 | | |
| 391 | | | 862 | 114 | 251 | | |
| 721 | | | 1 591 | 116 | 256 | | |
| 1 113 | | | 2 453 | 10 | 22 | | |
| 720 | | | 1 587 | 104 | 229 | | |
| 9 663 | | | 21 803 | 1 744 | 3 844 | | |
| 31 813 | | | 70 135 | 5 114 | 11 274 | | |
| 32 t. | | 31.494 Engl. tons | | 5 t. | 4.921 Engl. t. | | |

not exceed 25 % of the tare weight of the light-weight vehicles.

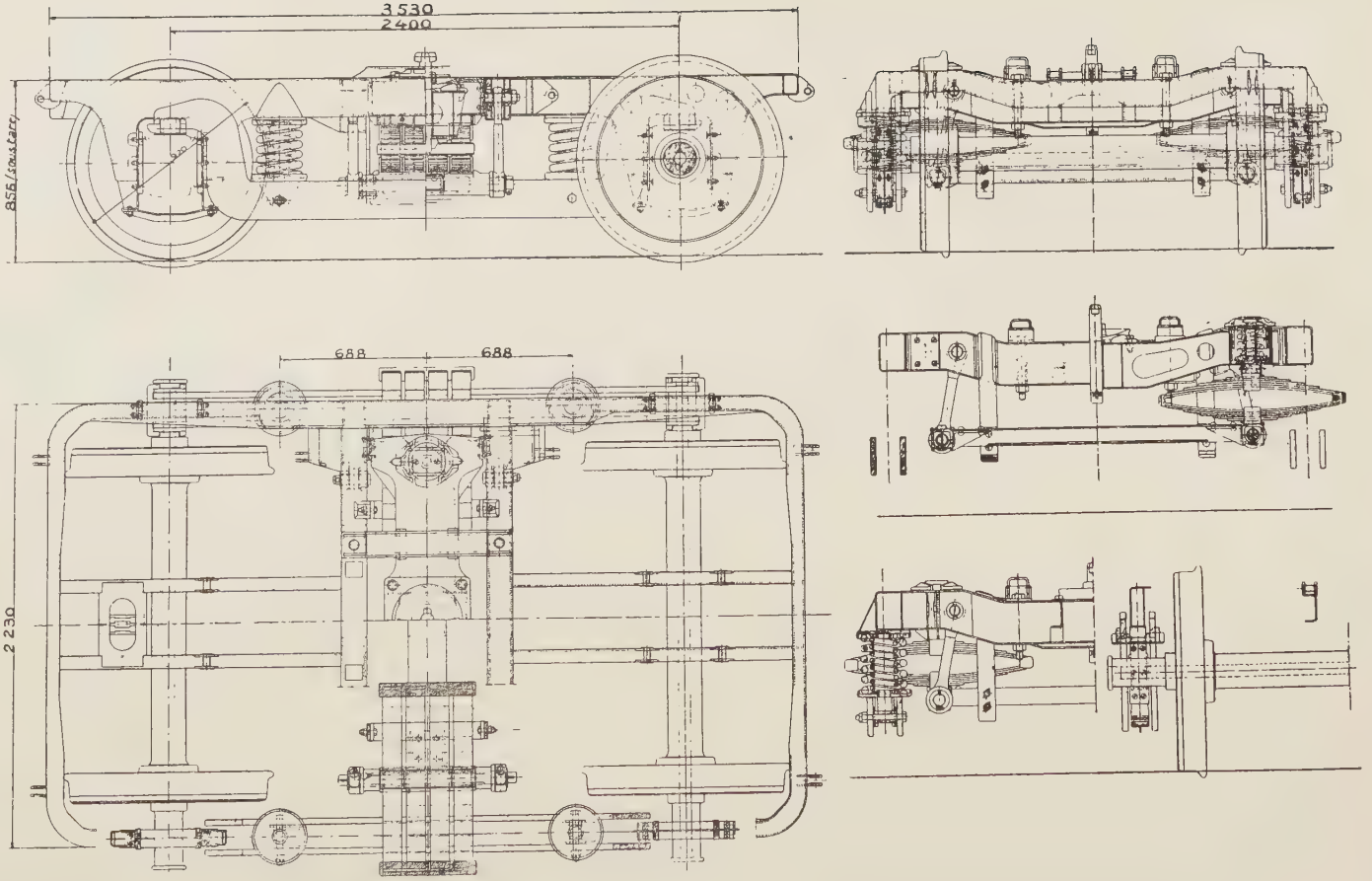



Fig. 13. — Pennsylvania type bogie.

BODY constructed of pressed and welded plating.
PRIMARY SUSPENSION with swing links and helical springs without shock absorbing gear.
LATERAL STABILISATION secured by reduction of play on axle boxes in their guides, an operation facilitated by use of jigs during building.

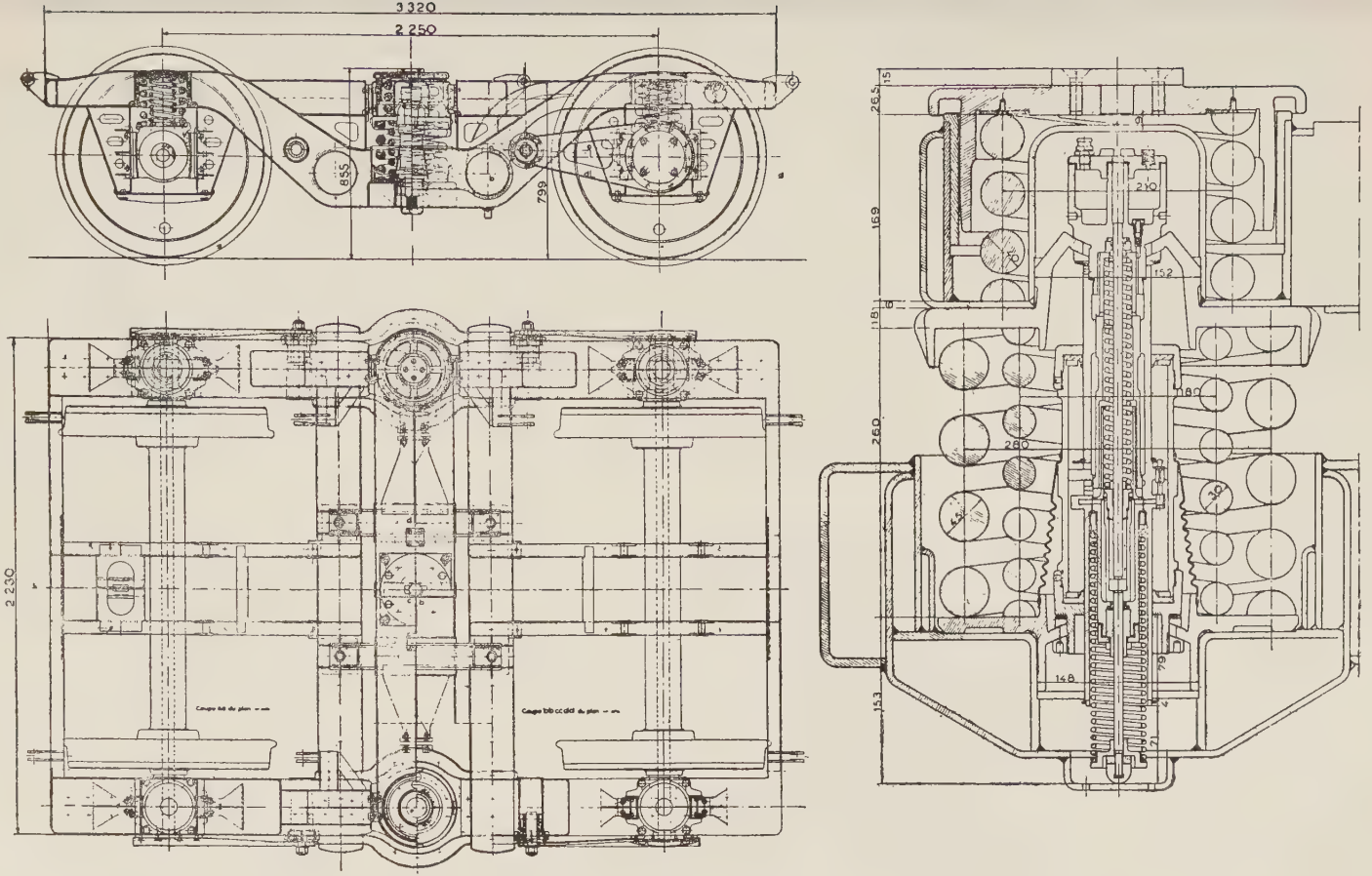



Fig. 14. — Super-light weight bogie.

BODY constructed of pressed and welded semi-hard steel members.
PRIMARY SUSPENSION consisting of helical springs directly connected to the oil boxes.
SECONDARY SUSPENSION of helical springs damped by a special hydraulic device.
REDUCTION IN HUNTING obtained by rigidly connecting the roller bearing axle boxes by rods carried on silent-block mountings.

by means of helical springs, whilst hydraulic shock absorbers of a new type smooth out road shocks. (See *Revue Générale des Chemins de fer*, January, February, 1944.) The axle boxes are connected longitudinally by means of rods in such a way as to suppress hunting and the consequent discomfort in riding and wear of tyres and rails (Fig. 14).

*Vans.* — No hard and fast rules are laid down for the adoption of either four-wheeled or bogie vans, as, irrespective of the type selected, a method of construction can be adopted which embodies all the reduction in weight, economy in construction and maintenance and safety embodied in the passenger coaches.

## SECOND PART.

### Discussion of several questions relating to the basic principles of all-metal construction.

Comfort and safety have always furnished and will continue to furnish much fruitful material for discussion and controversy. It is not intended to investigate all the arguments on this theme, but to examine more closely several basic ideas which seem to furnish grounds on which to build the outlines of a theory wherein technical considerations and difficulties can be reconciled with legitimate hopes and strivings after perfection.

It is well known that many controversies would fade out were the subject thereof examined in the light of a fuller understanding of the causes and premises thereof, without the introduction of à priori conceptions and ideas, the majority of which are usually vague, inexact, or based on false analogies.

It is therefore intended to examine the trend of ideas regarding safety in relation to reduction in weight, and then those which are concerned with the use of special metals, and, finally, the subject of corrosion.

#### Safety.

Particularly in latter years, safety of passengers has been the subject of close attention by Railway Companies, far surpassing that devoted to the matter by other methods of transportation. Leaving aside the considerable progress which has been effected in permanent way and signalling practice, which are not within the scope of this paper, it is trusted that it has been shown beyond doubt that all the efforts of the Research Departments of the Companies and subsequently that of the S. N. C. F. have always been directed to the goal of finding a design that will have the maximum resistance to shock, and at the same time, will utilise the latest and most efficient ideas and methods, both of construction and of material utilisation.

But for this constant effort to ensure safety, the ultra-lightweight methods of body building used in the aero and automobile industries would be employed. This would be fatal to success in the attainment of safety.

1930 was an average year for railway accidents, and, at that time, the greater part of the rolling stock in use was a long way from being fitted with all the safety devices which it is intended to embody in future construction. In the year under notice, 35 passengers and 29 trainmen were killed, whilst a total of 29 211 million passenger-kilometers (18 151 million passenger-miles) were run. This represents 2.2 persons killed per thousand million passenger-kilometers (3.5 persons killed per thousand million passenger-miles), (or 1.2 if only actual fare-paying passengers are counted). During the same year, the number of motorists killed was 1 377 for 20 000 million passenger-kilometers, which represents 68 motorists killed per thousand

million passenger-kilometers, or thirty times greater than the corresponding figure for the railways.

It would be illogical to proceed further and give an absolute definition of the word « safety », when the magnitude of eventualities that may occur is not even definable. The magnitude of these eventualities may even be so great as to overwhelm all precautions humanly conceivable.

If even only a state of quasi-security is desired, it would be necessary to provide a structure of unparalleled strength equipped with shock absorbing devices of such size that the number of passengers that could be accommodated in such a vehicle would be far below the standard which would make economic operation feasible.

* * *

It would also prove impossible to attempt to define the degree of resistance with which vehicles might resist either longitudinal or lateral stresses and forces.

Present-day underframes can resist a static force of compression of the order of 500 tonnes (492.103 Engl. tons).

The combination of hollow girders and other members is, in effect, a powerful spring, whose efficiency and elasticity is far superior to any arrangement of spring buffing gear.

The magnitude of accidental shocks liable to be encountered in actual practice is incalculable, since their effect is in accordance with the basic formula $mv = \int f.dt$, which depends essentially upon an unpredictable time factor, varying greatly according to the circumstances and location of the point of impact.

No plate, irrespective of its thickness, can resist rupture as a result of percussive forces. Certainly, the effect of the blow spreads out, and when the rupture reaches the main members of the structure, their duty then is to prevent or at least to absorb by deformation, the slower forces which follow as a result of the initial shock. The welded connections then serve as a base for these necessary distortions. Consequently, the telescoping of earlier days is now superseded by a simple series of ruptures and fractures, which are usually of so

Fig. 15. — Example of rupture of plates in a welded coach.

localised a nature that window lights located only a short distance from the point at which the impact has been absorbed are still intact (Fig. 15).

This is the reason why a modern method of construction will, save under the most exceptional circumstances when immense forces come under consideration, keep down the list of the injured to a small figure. This is in sharp contrast to the dreadful telescoping of wooden coaches, which are cut down to floor level with a correspondingly large destruction of life and property, spread over a wide area due to the breaking up of the wooden members.

In conclusion it may be added that there would appear to be anxiety regarding the lateral resistance to diagonal impacts or blows. It is desired to clear

away all doubts on this score by again affirming that the connections between the sides and the underframes and between the roof and the sides; the absence of projections at the doors; the continuous hoops of the tubular girders; the high moment of inertia of the cross-members of the underframe; the built-up sole bars; all these unite to withstand the rupture of the sides to a degree that far surpasses anything that has yet been constructed.

**Reduction in weight.**

Aviation and automobile experts usually consider a railway coach as being unnecessarily heavy. It must be pointed out that if automobiles, which enjoy the immense advantage of running on pneumatic tyres — a very important point — were to operate in solid trains with rigid wheels running on rigid rails, their chassis and running gear would necessarily have to approximate to railway practice. Further, if the size of their coachwork were the same as on the railway, i.e. 25 times greater in volume, the standards of design now usual in automobile practice could not be continued, except at a considerable sacrifice of safety.

It must not be forgotten when making comparisons of this nature that a public utility such as a railway is tied down to certain rigidly defined standards of safety and comfort, particularly with regard to lighting and heating. Up to the present, these standards have never been considered necessary in the automobile world.

Is it necessary to emphasise that the railway is the only public utility which gives such a service as will permit passengers to read at all times in a good light ? No one will dispute the fact that it is only in a railway carriage that real rest can be obtained on a long journey.

How many people are aware of what all these standards mean to the railway from the point of view of weight ? For example, to provide electric lighting and heating, a battery of 19 nickel-cadmium elements is required, which takes up a space measuring 3.150 × 0.600 × 0.400 m. (10.334 × 1.968 × 1.312 ft.), and weighs 865 Kgr. (1 907 lb.) for each coach. Does the automobile suffer from a similar handicap ?

It will be said that the railway vehicle is badly handicapped by its liability to telescoping on derailment as compared with the automobile, which runs on the roads as a single unit and not in trains. It is also agreed that a steel tyre running on a steel rail is a recognised cause of inter-cristaline fissuration of steel parts. This fact calls for important precautions on the part of the railway authorities, and adds to the unfavourable conditions which tend to hamper them. Consequently a very much more substantial, and therefore a much heavier type of construction is required in railway practice than is met with in the automobile world. Other difficulties of railway operation must also be taken into consideration. Since the railway companies themselves appear to have overestimated the quantity and quality of material necessary to attain safety in carriage construction, and, as they now appear to have definitely embraced a policy of reduction of weight, would it not be possible to stride ahead and to follow whole-heartedly the example of the rail-car ?

The reply to this suggestion is that to carry it out completely would distort the basic premises of the problem. That imitator of the automobile, the railcar, runs no risk of telescoping, and thanks to the stringent operating rules and signalling methods which prevail on the railways, is very rarely involved in collisions. The construction of railcar bodies can, therefore, be of a far lighter nature than that of the body of an ordinary railway coach.

It may be convenient to add at this

juncture that in order to put the question in its true perspective, the weights, and hence the type of construction, of early railcars were limited by the low powers of the Diesel engines then employed, as well as by the conditions under which the services had to be carried out.

As the inescapeable result of that formula which is the base of all dynamical calculations, $F = m\gamma$, it follows that when the two extreme terms are already fixed, the mass thus remaining available for building the vehicle was reduced to such a small quantity that no method of construction then known in railway circles, even taking advantage of every permissible reduction in weight, would afford the necessary standards of comfort and safety.

Hence, existing types of railcar construction do not furnish any lessons which are of use in studying the question of weight reduction as applied to passenger coaches of the ordinary type.

It has therefore been necessary to strike out in a fresh direction to obtain improvements and weight reductions, and which could only be done after much thought and reflection.

Considering only the steel framing and the moving parts, the first step was to search for new possibilities in weight reduction which would increase the importance of the part played by the framework and moving parts more than had previously been possible with the large safety factors considered necessary by an older and possibly more timorous school of thought.

Nevertheless, the problem called for a stringent examination, since it had to be remembered that, with certain trains, the vehicles would be required to travel at speeds in the region of 160 Km./h. (99.4195 miles per hour). At this speed the power necessary for haulage increases by 77 % over that required at a speed of only 120 Km./h. (74.564 miles per hour). Therefore any possible reduction in weight which would, for example, reduce the tare from 32 tonnes (31.494 Engl. tons) to 25 tonnes (24.605 Engl. tons) (a reduction impossible under present conditions of construction) would mean the extra power required was only 50 % greater than that necessary with ordinary coaches of 32 tonnes tare at 120 Km./h.

If as a result of using new materials and methods the general nature of the structure as a whole still approximates to theoretical conditions, a precise analysis of the structural details would prove to be illusory. Ideas and conceptions based on calculations of the resistance of materials are rapidly approaching a point at which they become meaningless. They will soon pass even beyond this point.

To obviate the risk of passing arbitrary judgment and to avoid making dangerous statements, it will be necessary to turn to experimental methods. The first step will be to devise and construct powerful means of investigation into the properties of light metals. Much still remains to be learnt about these metals from a dynamic standpoint — chiefly their endurance and tendency to fissure.

A test laboratory will have to be organised sooner or later wherein experiments on the stability, endurance, liability to shock, etc., can be carried out on models, and to which can be added photo-elastic research, for which latter purpose the existing laboratory is already equipped.

The organisation and equipment of such a laboratory is already under discussion.

An opinion frequently heard even in railway circles will now be examined. It is : to what extent will the continued search for maximum weight reduction affect stability and comfort, since a high dead weight has always been considered in the past as affording a guarantee of these qualities.

These fears, which are due to lack of proper knowledge of the basic details of the subject, will now be proved to be groundless.

It is not intended in the pursuit of the enquiry into weight reduction to brush aside old and well founded ideas prevalent in railway practice.

It is well known both in theory and in practice that the standard of comfort in a vehicle of 30 tonnes (29.5261 Engl. tons) can be just as high as that of a vehicle of 50 tonnes (49.2103 Engl. tons). It is even possible that it may be greater, for example :

— side panels of semi-hard steel of a 2 mm. (5/64 in.) thickness are just as soundproof as side panels of ordinary mild steel of 4 mm. (10/64 in.) thickness, in fact more so if they are backed with some insulating material;

— a light-weight suspension gear with helical springs and shock absorbers can be far smoother and quieter in running than a heavy arrangement of plate springs, and it is well known that vertical stability is closely linked to the period of oscillation, which latter is a function of the camber of the springs. It is therefore allowable to reconcile the flexibility of the latter to the tare weight, and thus establish a suitable period of oscillation;

— transverse stability is one of the most important factors of comfortable riding, and, as is now known, is dependant entirely on the longitudinal play of the axle boxes in the guides. If his play is minimised, as can now be done with the aid of jigs, or, better still, the axle boxes connected by tie rods, the bogies will ride smoothly, in sharp contrast to the swinging movement which characterises vehicles having a great amount of play in their boxes. A light-weight vehicle thus equipped will prove to be very much more stable than the ordinary type of heavy vehicle;

— furthermore, is it not true that one of the chief factors contributing to smooth riding is the reduction of unsprung masses such as axles, wheels, oil boxes, etc. ? The excessive weight of these parts may well form the subject of future investigations.

No more campaigning is required in the battle for weight reduction; it has been well and truly won, and has relied on the results of experiments and incontroversible logic for its victory.

The latest O. C. E. M. coaches weighing 41 tonnes (40.352 Engl. tons); the stream-lined Ouest vehicles of 36 tonnes (35.431 Engl. tons) and the light-weight suburban coaches of the « Est » all bear witness to a stability and noiselessness, at the very least equal to that of the heavier vehicles which they have superseded.

The extra expense incurred as a result of weight reduction must not be overestimated. These expense are of two kinds : cost of material and transformation charges.

Even should the material used (special steels and light alloys) prove to be more expensive, their greater resistance and lighter weight will contribute materially to the reduction in weight — and hence to the total cost. Their resistance to corrosion and greater strength will also tend to give them a longer life.

Growing progress in the technicalities of light-weight construction, as well as economies resultant on future mass-production methods, will constantly tend to reduce the second item of cost.

Finally, it will be found that the cost of weight reduction will, happily, be counterbalanced by savings on the cost of haulage. It may be estimated that for a train of 15 vehicles, each of a tare of 32-34 tonnes (31.494-33.463 Engl. tons) in lieu of 40-50 tonnes (39.368-49.210 Engl. tons), the average reduction in train weight of 180 tonnes (177.157 Engl. tons) will decrease the haulage cost by nearly 10 %.

A further reduction of 2 tonnes (1.968 Engl. tons) per vehicle resulting from

the creation of a class of super-light vehicles should produce a further economy of hardly less than 4 % on the haulage charges of the above-mentioned train. This may be considered as being equivalent to 1 franc to 1 franc 50 centimes per train-kilometer for fuel and locomotive maintenance costs.

Even if this economy is not absorbed by the extra expense involved in the construction and maintenance of super-light vehicles, it would be very small in proportion to the net cost per kilometer of running the train. This may be split up as follows :

| | *Price in 1944.* |
|---|---|
| Fuel . . . . . | 9.— fr. |
| Wages . . . . . | 5.— fr. |
| Sundry locomotive expenses . | 3.— fr. |
| Maintenance of locomotive and tender . . . . . | 6.— fr. |
| Maintenance of vehicles . . | 10.— fr. |
| Depreciation of locomotive and tender . . . . . | 7.50 fr. |
| Depreciation of vehicles . . | 32.— fr. |
| Total . . . | 72.50 fr. |

There are also other advantages resultant on the reduction in weight, although they may be difficult to express accurately in figures :

— the train can be hauled by less powerful locomotives, and therefore less expensive, and setting up lower track stresses. It may even be possible to avoid the necessity for ordering new engines;

— the number of vehicles making up the trains can be increased without reducing the average speed or increasing the power of the engine. This can be of great interest at times of peak loads, since it may obviate the necessity for extra trains;

— the average running speed of trains may be stepped up without increasing the locomotive's power. This applies particularly in hilly districts, and follows as a result of the reduction in power required on inclines or at starting.

In conclusion, the reduction in weight makes it possible to make a better use of the existing locomotive stock, and to reduce the number of more modern and more powerful locomotives needed to cope with increases in speeds and capacities of passenger trains.

* * *

**Notes on special steels.**

It has been stated that the resistance of light-weight structures was due in great measure to the use of semi-hard steels of 60-70 Kgr. (132-154 lb.) resistance, and having an elastic limit of 40-45 Kgr. (88-99 lb.).

Certain authorities have opposed the use of these steels on the ground that the use of steel of high resistance as a means of increasing the ability of a body to resist crushing is useless, since the modulus of elasticity — which regulates buckling — does not vary, irrespective of the quality of the steel used. This argument cannot be accepted, since it does not take into consideration the fact that the hollow reinforced members used in this style of construction only have very short sections liable to buckling stresses, and are therefore only under pure compression. Further, should the impact strike above the level of the underframe, the partitions and sides are in tension right up to the point of rupture.

* * *

**Corrosion.**

The extreme thinness of the plates makes the question of corrosion extremely important. From the very beginning the « Est » system overcame this trouble in their vehicles by adopting a device which allowed the products of condensation and rainwater to drain a-

way immediately, and at the same time permitted air to circulate through the structure. This arrangement has been tested in practice, and, as a result, has been fitted to the new vehicles of the S. N. C. F.

It may be stated that reduction in weight implies a strengthening of the protective processes, and it will be necessary to examine the question of the application of neutralisation processes to the plates, as well as the suitability of paints having synthetic resins as their base.

* * *

**Problems of the future.**

Will a limit be reached in this progressive journey on the road to weight reduction, bound up as it is with a continuous improvement in the quality of materials and methods of their utilisation ?

To reply effectively to this question is far from easy. The subject has been thoroughly treated in various previous works, and space is lacking here even for a simple summary.

In any case reduction in weight cannot be carried on indefinitely without postulating, at a certain stage which may already have been reached, a definite revision of ideas concerning safety on railways.

It is not proposed to reply to that delicate question whether railway travel in the future will enjoy as high a margin of safety as is the case to-day. This aspect of the problem is bound up with the ideas, outlook and thought-processes peculiar to each generation, and does not fall within the scope of this article, which was only intended to describe the various forms and the evolution of carriage construction, and to investigate the various factors which determine this evolution (local conditions, influence of ideas of the day, etc.) without passing any judgment on these factors.

It is the duty of the engineer in charge of railway research to continue as a watchful guardian of that standard of safety which considerations of justice and humanity impose. To maintain this attitude as long as circumstances render it possible it will be necessary to strike a mean between a progressive reduction in weight and the necessity for a continuous improvement in the quality of materials used and the method of their utilisation.

NOTE. — The use of reinforced plastic substances which imitate ligneous vegetable tissues may one day disclose vast possibilities, and may be the cause of a complete change in the methods used wherein bars and plates of steel or light metals are employed.

* * *

This article would not be complete if some reference were not made to certain efforts which are now being made to reconcile ideas concerning methods of construction and safety now extant in railway practice with those pertaining amongst automobile and railcar manufacturers. This is actually being investigated by a private firm — Messrs. Michelin — who have under consideration a design for a set of 6 coaches mounted on pneumatic tyred wheels and having a tare weight of 16-18 tonnes (15.747-17.715 Engl. tons) each, and which are intended to be constructed of stainless or ordinary steels or possibly of aluminium alloys. The difficult problems that have arisen in connection with this project are not yet solved, and it is not intended to go into details concerning them, nor to pass any judgment concerning the possibilities of their solution. The fact that these vehicles are not intended for use in international traffic, and hence do not have to conform to certain restrictions imposed by the International Technical Union, certainly facilitates the solution of these problems.

Little has been said on the subject of body construction in stainless steel or light alloys, as it was deemed advisable to limit this paper to a description of and a commentary on methods which would satisfy all requirements of regular railway operation. For this reason, certain aspects of the matter which have been the subject of specialised and difficult research work, have not been touched upon, but, as a conclusion, their nature will be briefly indicated:

— Construction on the tubular principle using stainless steel has unfortunately brought to light a difficulty in welding, not yet satisfactorily overcome as far as resistance to shocks is concerned.

— The problem of utilisation of light alloys for frameworks is complicated by the poor resiliency and low modulus of elasticity of these materials, as well as the mechanical inefficiency of their welded joints. Although good results have been obtained under static conditions with alloys of the type of Alpax Gamma, Duralinox and Apm, nothing is yet known of their behaviour under dynamic conditions. A great deal more laboratory investigation on a large scale is necessary with such materials than with steels before sufficient light can be thrown on the possibilities of constructing light-weight structures, which, from the dynamic standpoint, will not give rise to justifiable fears.

This is an important problem, and the solution thereof will determine in which direction the path of future light-weight construction will lie. Subject to commercial considerations as to the scarcity or otherwise of steels or light metals, the tendency in railway practice is to assume that the solution of the material problem will be found more easily in the utilisation of high-resistant steels rather than light metals. This is a debatable point of the highest interest which only the future can solve.

— At the moment, the deciding factor in the employment of either of the two materials (stainless steel and light alloys) is the very high prime cost of these substances.

[ 656. 237 (.73) ]

# Micro-filming speeds waybill handling.

*(Railway Age).*

The micro-filming of station and accounting records was inaugurated on the Rock Island in 1938, resulting in a great increase in the speed with which freight cars are interchanged with foreign lines. Delays resulting from the time taken by yard clerks to copy by hand or typewrite essential accounting information contained in the waybills have been eliminated. Micro-filming involves the reduction of original paper documents to film miniatures which, on being developed, can be enlarged many times on translucent screens, or as facsimile prints. The fastest typist requires several minutes to copy an average full page letter and approximately one minute is required for a clerk to copy a waybill, but through the use of micro-filming 35 to 60 duplicates can be made in one minute.

### Operation is automatic.

The Recordak photographing machine, used for the micro-filming, is mechanically operated. Exposure time and focus are regulated and no adjustments are required. As the documents are fed into the machine, they pass over a revolving drum and are photographed on 16-mm. film, which moves in synchronization with the drum, as the bills pass an opening. The amount of film used for each exposure is automatically controlled, and just the right amount of film is advanced to include the subject being filmed. The photographing is accomplished automatically and if the waybills are fed incorrectly, or if the film should become exhausted, a warning bell rings.

When information is desired from waybills that have been micro-filmed, a stenographer transcribes it from a film image approximately one and one-half times the size of the original, which is projected on a translucent screen of a Recordak film-reader. The projection head of this machine is mounted on top of a cabinet and carries the complete film gate and winding mechanism. The head is designed to rotate through 360 deg. to permit the upright viewing of images regardless of their position on the film.

Recordak machines for the micro-filming and projection of waybills on the Rock Island were first installed at larger terminals such as Chicago and Burr Oak, Ill., Kansas City, Mo., Armourdale, Kan., Council Bluff, Iowa, and Ft. Worth, Tex. The machines located in the Chicago and Kansas City offices were used for billing local l. c. l. collect shipments, while the other machines were for the purpose of eliminating the manual preparation of junction passing reports.

### Steps up efficiency.

After a careful analysis of the results obtained from several years' performance the railway decided that micro-filming possessed merits which could be utilized advantageously at other less congested terminals. Subsequent installations speeded the handling of passing reports and, by insuring against omissions, provided more accurate and more detailed records — effecting also a material reduction in clerical effort. Micro-filming equipment is now in service in yard at Joliet, Ill., and Amarillo, Tex., in connection with the preparation of junction passing reports. At the Memphis, Tenn., freight office this method is being used both for junction passing reports and local l. c. l. collect waybilling.

The micro-filming equipment used at the larger terminals is designed to make duplicate copies of the film simultaneously. The exposed films are cut at midnight each day and mailed to the Recordak laboratory, where they are developed on the day of arrival. One copy is returned to the originating terminal to serve as a passing report and the second copy is mailed direct to the accounting department at Chicago for use in preparing daily freight traffic manifests and accounting purposes.

Smaller terminals employ smaller micro-filming units comprising a combination camera and reader, capable of making approximately 35 exposures per minute. Unlike the larger terminals where a much greater volume of traffic is handled, the small terminals cut the exposed film at midnight every third day and mail to the laboratory for developing. Only one copy is made and this is returned to the originating terminal. Upon receipt of the developed film at the terminal it is run through the reader side of the Recordak and a passing report is prepared from the film, these reports being supplied to the accounting department in the usual manner. Although these small terminals do not have a large number of waybills to enter on their passing reports, this method of handling offers tangible relief, since the preparation of the passing report can be shifted to a non-rush period.


Key punch operator in Hamilton Park (Chicago) accounting office transcribing from a film-reader directly to an I. B. M. card punch. Daily freight traffic manifests and other accounting data are prepared from these micro-filmed waybills.

**Equipment rented.**

Recordak micro-filming equipment is furnished to the Rock Island on a rental basis, which includes servicing and inspection. The accompanying table gives the approximate cost for micro-filming waybills at both the large and smaller terminals. These figures include rental of equipment, film and developing charges.

| Number of waybills daily. | Small terminal approximate monthly cost. | Large terminal approximate monthly cost. |
|---|---|---|
| 100 | $ 27.00 | $ 47.40 |
| 200 | 30.75 | 52.20 |
| 300 | 34.50 | 57.00 |
| 400 | 38.25 | 61.80 |
| 500 | 42.00 | 66.90 |
| 600 | 45.75 | 71.70 |
| 700 | 49.75 | 76.50 |
| 800 | 53.25 | 81.30 |
| 900 | 57.00 | 86.10 |
| 1 000 | 60.75 | 90.90 |

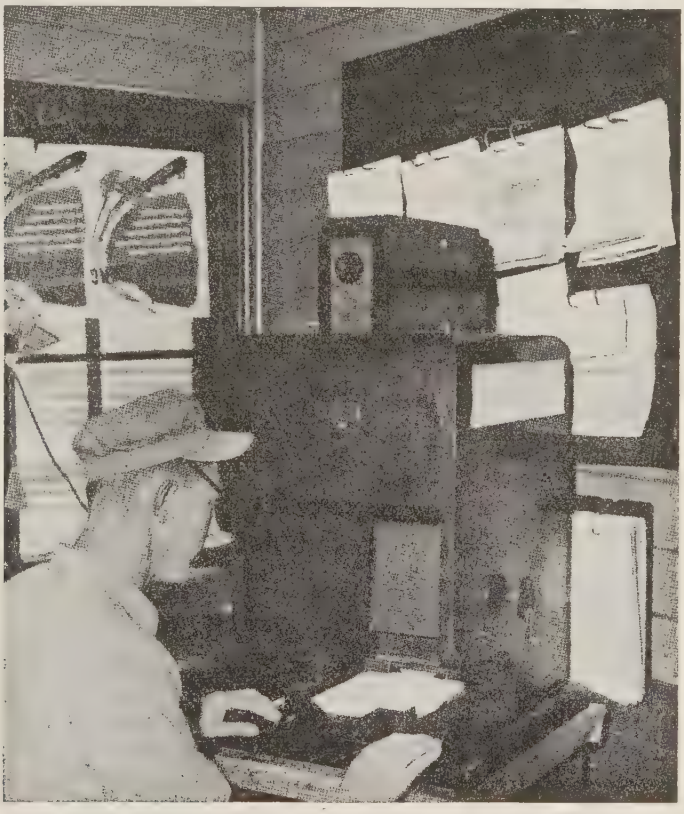
Under the old plan, junction passing reports were prepared manually at all stations, either by typing or writing all the required information from the original waybills. This, of course, resulted in the holding of waybills for making the passing report, delayed car deliveries to connecting lines and often held up the switching crew while the clerk was completing the passing report. In many instances errors were made in transcribing the information and waybills were inadvertently omitted, because of employees' hurried efforts to prepare this record in the least possible time.

In the handling of local l. c. l. shipments, the micro-filming of waybills has done much to improve the movement of freight shipments, and eliminate errors in billing and their resultant claims. Shipping orders are given a waybill number upon receipt, and the date is

Clerk in Rock Island's Kansas City office photographing waybills. This procedure, in addition to expediting interchange, has eliminated the preparation of a duplicate waybill for cars that are diverted at this terminal.

inserted in a stamp imprint placed in the upper right hand corner. Sufficient space is provided in this stamp for showing rates and the extended freight charges. After numbering, rating and extending the charges, the shipping orders are photographed, after which they are allowed to accompany shipment to destination in lieu of a waybill. The shipping orders serving as waybills are treated by the receiving agents in the same manner as any other waybill. The developed film is retained at the station and serves as the billing record.

Originally the waybills for local l. c. l. shipments were prepared manually by billing clerks or other employees by typewriter. These waybills were prepared from the shipping order part of the bill of lading, after the latter had the rates insertion thereon and the freight charges extended. Essentially, all the data regarding destination, consignor, consignee, articles, weight, rates and the charges were wholly transcribed from the shipping order to a waybill form, thus making the waybill an exact duplicate of the shipping-order.



Yard clerk at Joliet freight house micro-filming waybills with combination camera and reader before delivery to connecting lines.

**Diversions at terminals.**

Prior to the installation of micro-filming equipment it was necessary to make a copy of the waybill for each car that was diverted. This copy, like the original, gave all the information before diversion and also the corrected information after diversion. This duplicate copy is no longer required, since the original, after having the diversion information applied thereon, is micro-filmed, thus the agent has a facsimile of the original waybill to retain in his files.

When delivering carload shipments of perishables to connecting lines, the agent at the off-going junction point is required to submit to the superintendent of refrigerator service a detailed report, showing all pertinent information, such as the amount of ice in bunkers, whether vents are open or closed and other data regarding heaters and ventilators. Prior to the installation of the micro-filming system, it was necessary to hold the original waybills until the required information could be transcribed to the protective service report. By the use of photography, these reports are now being made from the developed film; in this manner they are being made more accurately since the necessity for haste is eliminated.

**Eliminates searching files.**

Micro-filming is also assisting in the handling of interchange corrections. The auditor of car service accounts finds it necessary from time to time to issue corrections in connection with the interchange reports rendered by the various terminals covering cars delivered to foreign lines. These corrections often cover discrepancies in car initials or numbers and, under the old system, considerable time was consumed in obtaining the required information at the terminal points to make these corrections. Usually the correct information was obtained from the car index book, or by going through the various switch lists and possibly the inbound train consists. These latter documents were frequently not filed in such a manner that they could be easily located.

Since the installation of the photographic system much of this file searching has been eliminated. When the correction covers a carload shipment, the delivery date is shown on the correction. It is, therefore, a simple matter to locate the copy of the waybill appearing on the film, where the correct information may be readily found, since it is an exact reproduction of the original waybill.

One of the most recent applications of micro-photography on the Rock Island was in conjunction with the introduction of one-coupon railroad tickets, inaugurated in cooperation with the Southern Pacific. The use of one-coupon tickets gave rise to many complicated accounting problems, since the road last hauling the passenger was required to furnish the other carrier with a duplicate ticket containing all information appearing on both sides of the original for billing and accounting purposes. To eliminate the necessity for copying data from both sides of these tickets, micro-filming equipment was installed to photograph each ticket lifted by the Rock Island, and the Southern Pacific is now furnished a facsimile for protection of revenue and checking purposes.

Micro-filming is also being used in the engineering, treasury, legal and real estate departments of the Rock Island. At present this process is being used for the preservation of land valuation records, station plans, standard plans, right-of-way maps, profiles, bridge and build-

ing plans — primarily as a safety measure against the possibility of destruction of the original.

Copies of many of the 888 different reports required by the federal and state governments must be retained by railroads for various periods ranging from one to fifteen years, while others must be retained permanently. This large volume of records requires extensive vault and storage space. The Interstate Commerce Commission has long recognized this handicap and, upon application, numerous carriers have been granted permission to use micro-film photographs for original records.

[ 656. 222. 5 (.73) ]

# Passenger service developments in the U.S.A.

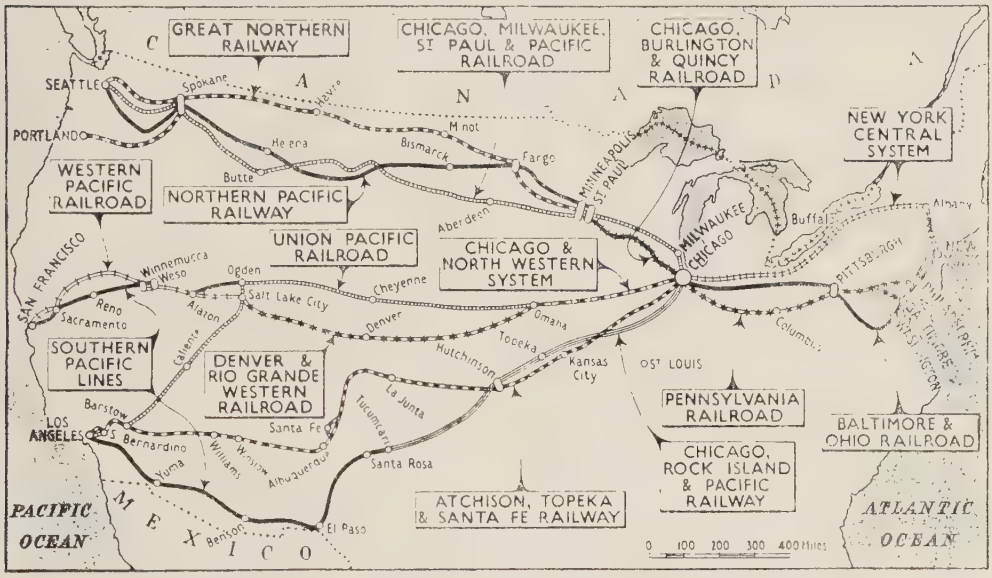
*(The Railway Gazette.)*

History was made in the United States on March 31, when the first through sleeping-car services in American history began to operate daily between the Atlantic and Pacific coasts. In Canada for many years both the Canadian Pacific and the Canadian National Railways have had through trains in service between both Montreal and Toronto, in the east, and the Pacific port of Vancouver in the west, and, though these eastern cities are not strictly on the Atlantic, Montreal at least is on the tidal waters of the St. Lawrence River, and ranks as an Atlantic seaport. But whereas the C. P. R. and the C. N. R. have their own individual main lines stretching across the width of the continent, in the United States the great eastern systems terminate at Chicago and St. Louis, and in these « gateway » cities, until now, a change of train has been essential for the transcontinental railway passenger. In Chicago, also, there has been the additional disadvantage of a change of station.

Since the war this discontinuity of service through Chicago and St. Louis has come prominently under review. The first railways to bestir themselves in the matter were the Chesapeake & Ohio, Lackawanna, and Nickel Plate, but as their trains from the eastern cities into Chicago are slow as compared with those of the leading lines, no anxiety was shown by the railways west of Chicago to forge the necessary link for making through running possible. Now, however, the New York Central System and the Pennsylvania Railroad have moved, and at length the first through Atlantic-Pacific service is in operation. From March 31 the New York Central *Twentieth Century Limited* and the Pennsylvania *Broadway Limited,* have each carried all-room sleeping cars for Los Angeles, worked round from the La Salle Street terminus to the Dearborn station at Chicago to be attached to the *Chief* streamliner of the Atchison, Topeka & Santa Fe Railway. The *Chief* is also carrying a through sleeping car for Los Angeles, brought from Washington by the Baltimore & Ohio Railroad. Since then additional cars have been put in operation between both New York and Washington and San Francisco and Los Angeles by the Chicago & North Western-Union Pacific-Southern Pacific route from Chicago. From June 2 similar through facilities will be established jointly by the Pennsylvania and Rock Island companies between New York and Los Angeles by the Golden State route; and on alternate days from New York through New York Central and Pennsylvania, cars run to San Francisco by way of Denver.

This is only the beginning of post-war passenger development in the United States. From April 28 the *Twentieth Century* and the *Broadway* reverted to their 16-hr. run between New York and Chicago, which have been slowed to 17 hr. during the war emergency. The New York Central, with its route of 958 miles, has to maintain an average speed of virtually a mile-a-minute throughout, stops included, to make this timing effective; the Pennsylvania has a shorter distance of 902 1/2 miles, but the considerable handicap of Gallitzin summit, nearly 2 200 ft. above sea level, to negotiate in its run through the Allegheny Mountains. Not only so, but five other Pennsylvania expresses, including the *General,* the *Admiral,* the *Golden Arrow,*

and the all-coach *Trail Blazer*, will make the same run in 17 hr. overall, with a corresponding number on the New York Central System, and this will entail considerably more high-speed running than before the war. An important factor in these accelerations is the availability of overall time from 58 3/4 to 45 hr.; the Milwaukee Road is doing the same with its *Olympian* between Chicago and Seattle; the Burlington, Rio Grande, and Western Pacific companies similarly are transforming the *Exposition Flyer* from Chicago to San Francisco, *via* Denver




Principal centres and links served by through Atlantic-Pacific routes.

the powerful new « T 1 » class 4-4-4-4 express locomotives on the Pennsylvania, and the 4-8-4 « Niagara » class on the New York Central. Moreover, the first diesel-electric passenger locomotives owned by the latter company are now at work on the *Twentieth Century*, and when both competing routes have sufficient diesels, the New York-Chicago journey is to be made in 14 hr., possibly without night travel.

In many ways the year 1946 bids fair to be one of record development in United States passenger travel. New streamline trains are being built by the Great Northern and the Burlington lines, to provide daily high-speed service between Chicago and Seattle, with a cut in the and Salt Lake City, into a streamliner. Diesel-electric locomotives, of course, will haul these trains, and many others which are being changed from their present standard steam-hauled stock to the latest streamline equipment, such as the *Sunshine Special* of the Missouri Pacific and the Texas & Pacific, the *Texas Special* of the Missouri-Kansas-Texas and the St. Louis-San Francisco, the Frisco Lines *Meteor*, and many more. The Baltimore & Ohio Railroad is introducing diesel-hauled streamline trains which will make the run between Washington and Chicago without night travel. Cuts of 12 to 14 hr. are being made in the schedules of a number of trains between Chicago and the Pacific coast.

[ 625. 144. 4 (.73) ]

# What machines did for small rail gang.

*(Railway Age.)*

The possibilities in mechanizing small rail-laying gangs, long held in some quarters as unsuited to mechanization, have been demonstrated by the performance of a rail gang of 18 to 22 men on the Chicago & North Western. The experience of this gang is revealing because, through a rather unusual combination of circumstances applying to a particular rail-renewal job carried out in 1945, it first worked for a time without the aid of any power equipment, after which, in successive stages, four power machines were added; namely, a tie adzer, a nut runner, a spike puller and a spike driver.

Comparative figures of the performance of this gang show a phenomenal increase in output per man-hour following the addition of the various units of equipment. For instance, during the period when all the operations were performed manually, the maximum output of the gang, based on a single day's operations, amounted to 4 lin. ft. of rail laid per man-hour actually spent on constructive work. When the adzer and nut runner were added to the organization the maximum amount of rail laid for any day increased sharply to 8.62 lin. ft. per man-hour, or more than double the previous output. When all four of the machines had been placed in use the output increased further to a maximum of 14.25 lin. ft. of rail laid per man-hour, or more than 3 1/2 times the amount laid when no machines were used.

The foregoing figures cover all the operations involved in actually laying the rail, from the removal of the bolts to the piling of the released material, excluding only the time lost in getting to and from the job and in closing the track for trains. It is also important to emphasize the fact that the primary purpose of this article is to show the extent to which the performance of a gang can be enhanced with the aid of power machines, and not necessarily to present an outstanding or ideal example of mechanization. This point is made particularly in view of the fact that, as explained later, the circumstances were such that it was not feasible to equip the gang with a rail crane. Ordinarily, all rail-laying gangs on the C. & N. W. are fully mechanized, the major types of power equipment supplied including cranes, spike pullers, adzers, and bolt tighteners.

The particular rail-laying operation under consideration took place on what is known as the Freeport line, a single-track branch extending from West Chicago, Ill., to Freeport, 91 miles. The rail on 10.8 miles of this line was scheduled for renewal in 1945, but because of the labor shortage the amount renewed amounted only 2 1/2 track miles. It is the work involved in relaying this rail that is described in this article.

In the section of track where the rail was renewed the existing construction consisted of 90-lb. rerolled rail in 30-ft. lengths, carried on 18 ties per panel, fully-plated with single-shoulder tie plates. The ballast is pit-run gravel. In the renewal operation the existing rail was replaced with 90-lb. 33-ft. relayer rails from the main line, the lengths of which had been reduced to 31 ft. by cropping 12 in. from each end. This rail was laid with new four-hole angle bars on new larger single-shoulder tie plates, and was single spiked on each

side. The existing rail was not anchored, but in the renewal work the new rail was anchored with eight anti-creepers to each rail, equally divided to prevent movement in both directions.

The work of renewing the rail first got under way in March, 1945, when it was decided to relay a sufficient amount in one location to obtain a carload of old rail urgently needed for emergency use on another division. Under ordinary circumstances the smallest rail-laying organization used on this road consists of a gang of about 40 men, equipped with a crane, a spike puller, an adzer and a power wrench. However, because of the labor shortage, this job had to be done with a gang of only 18 men, which was formed by bunching five section gangs. Further, since all available power equipment used in rail-laying work was otherwise assigned at the time, and because the urgent need for the released rail did not permit waiting until a crane and other machines could be made available, it was decided to proceed with the work without the aid of power equipment.

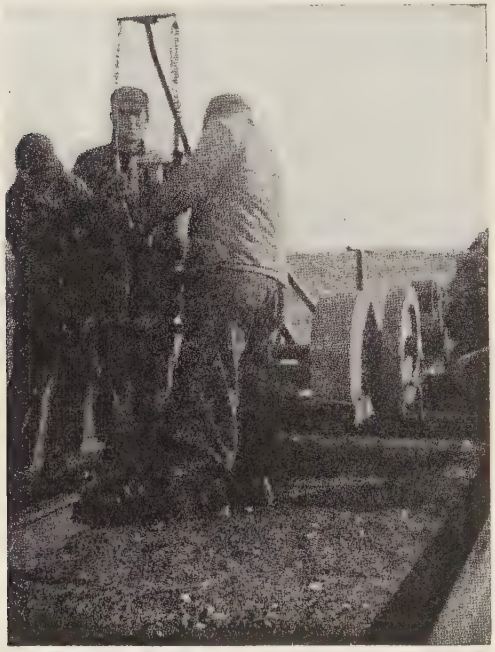
In the initial rail-laying operation (and later when the power machines were brought into use) the rail on one side of the track was laid at a time and the work was done under traffic. Both before and after the machines were added the gang worked 10 hr. daily.

**Output-no machines.**

Doing the work entirely by hand, the gang started laying rail on March 22 and continued for four days, during which time it laid a total of 3 300 lin. ft. of rail. One of the best days from an over-all performance standpoint was March 24. Of the 180 man-hours worked on that day, 140 man-hours were spent laying rail, 14 man-hours were spent cutting in for two trains, and 26 man-hours were consumed in traveling to and from the job. A total of 494 lin. ft. of rail was laid, which was equivalent to 4 ft. per man-hour actually spent laying rail.

After the 3 300 ft. of rail had been renewed it was decided to defer further work until the gang could have the use of power machines. In October a power adzer and a power wrench were made available, and the work got under

The first two machines placed in the hands of the gang were the power track wrench (left) an the tie adzer (right).



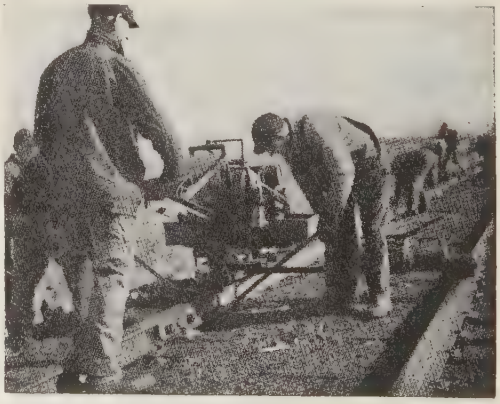
This mechanical spike puller was the third power unit to be made available to the gang.

way again on the eleventh of that month, using the same five section gangs, totaling 19 men, including two machine operators. Because of the small size of the gang it was not considered economical to assign a crane to it, although before starting the rail-laying work the use of a rail crane was obtained for a sufficient length of time to unload and distribute the rail to be laid.

**Output-two machines.**

The rail-laying work was carried on for five days with the aid of power adzer and the power wrench, during which the gang laid a total of 5 796 lin. ft. of rail. A day of good performance during this period was October 13, when, working a total of 190 man-hours, the gang laid 1 240 lin. ft. of rail. The distribution of time on this day was as follows : 144 man-hours laying rail; 12 man-hours cutting in for two trains; and 34 man-hours consumed in traveling to and from the job. Thus, the unit output of the gang amounted to 8.62 ft. of rail laid per man-hour actually worked.

October 16 was the last day that the gang laid rail using only the adzing and bolting machines. Work was not resumed until November 7, when the two power machines already in the hands of the gang were augmented by a third, namely, a mechanical spike puller. However, this set-up prevailed for only one day and on the following day (November 8) a mechanical spike-driving machine was made available to the gang, in addition to the three other units already in hand. The power spike driver used on this job was the pilot model of a new machine that has been developed by the Nordberg Manufacturing Company. Briefly, this machine consists of a full-revolving frame, mounted on a carriage by means of which it is rolled along on the rails from one spiking position to another. The revolving frame is a balanced beam containing, at one end, a revolving mechanical hammer, and, at the other, a 6-hp., 4-cycle, single-cylinder, air-cooled gasoline engine



The spike driving machine was the final power unit to be added to the organization.

which drives the hammer by means of three V-belts. The blows of the revolving hammer are delivered to the spike through an anvil, the lower end of which engages the top of the spike.

Weighing 28 lb., the revolving hammer rotates at a speed of 1 100 r.p.m. and strikes blows of 4 000 lb. The spike hammer drives one spike at a time, but through the swing of its frame it can be moved from one side of the rail to the other to permit the driving of spikes on both sides. For use with the spike driver a special spike holder has been developed, by means of which the spikes are placed and held in position for driving. Two of these spike holders are used with each spike-driving machine. The unit is operated by a crew of three men, including an operator and two laborers for handling the spike holders.

While the spike driving machine was in use on this job its performance was observed carefully. After the crew operating the machine had become experienced in its use, the best record achieved was the spiking of one rail (18 ties or 36 spikes) in 1 min. 30 sec. On the day during which the peak performance was achieved with the spike-driving machine the average elapsed time for spiking each rail was 1 min. 52 sec. The ties in the territory where the spike-driving machine was used were divided about equally between hard and soft wood. The experience with the spike driver was that it could be used all day without a change of operators or spike setters and that it was capable of driving as many spikes as could be driven by 12 men using spike mauls.

### With four machines.

During the period when rail was laid with the help of the four machines, the gang was composed of six section gangs, totaling 22 men, including three machine operators. This organization laid rail for nine days, during which a total of 15 536 lin. ft. of rail was renewed. The best performance during this period was achieved on November 14, when 2 480 lin. ft. of rail was laid. The 220 man-hours worked on this day were distributed as follows : 174 man-hours laying rail; 11 man-hours cutting in for one train, and 35 man-hours traveling to and from the job. Thus, the average output while actually laying rail was 14.25 lin. ft. per man-hour worked.

That the performance of the gang on November 14 was not greatly in excess of that achieved during other days of this period is indicated by the fact that on November 19 it laid 13.75 lin. ft. of rail per man-hour actually engaged in constructive activity. Again, on November 15, the average amount of rail laid was 12 lin. ft. per man-hour.

In comparing the production figures for this gang when using power equipment with the output when the work was done manually, it is important to bear in mind the fact that, because of the limited size of the gang, the full potentialities of the machines were not realized. Obviously, if the gang had been of such size as to permit the machines to be kept in operation a greater percentage of the time, the performance would have been even more striking.

The rail-laying work described in this article was carried out under the general direction of E. C. Vandenburgh, then engineer maintenance of the Chicago & North Western System and now chief engineer, and of P. V. Thelander, division engineer of the Galena division, both of Chicago, and was under the direct supervision of A. Netzel, roadmaster at West Chicago.

Daniel WILLARD.

[ 385. (09.2 ]

# OBITUARY.

## Daniel WILLARD,

Formerly Chairman of the Board of Directors and President ot the Baltimore and Ohio Railroad.
Former Member of the Permanent Commission of the International Railway Congress Association.

On the 6th. July 1942 died one of the most eminent personalities of the American Railroads and a true friend of our Association, Mr. Daniel Willard, Chairman of the Board of the Baltimore and Ohio Railroad.

Daniel Willard was born on January 28, 1861, in North Hartland, Vermont (U. S. A.). He attended the district school until he was sixteen. He then taught the district school in nearby Hartland, for two years, and graduated from high school in Windsor in June, 1878.

In the fall of the same year he entered Massachusetts Agricultural College at Amherst, and remained there until the following March, when he was obliged to leave college because of serious trouble with his eyes. He then entered the service of the Vermont Central Railroad at North Hartland, Vt., as track laborer. The following year he became a fireman on the Connecticut and Passumpsic Rivers Railroad, now a part of the Boston and Main, remaining in the employ of that company as fireman and locomotive engineer until October, 1883.

Mr. Willard then went west to Elkhart, Ind., and entered the service of the Lake Shore and Michigan Southern as locomotive engineer, remaining in the service of that company until the following spring.

His next employment was with the Minneapolis, St. Paul and Sault Ste. Marie Railway Company (the Soo Line). He entered the service of that company in July, 1884, and remained for fourteen years. He was, at times, conductor, locomotive engineer, foreman in the mechanical department, trainmaster, assistant superintendent and superintendent. He resigned as superintendent in 1899 to accept the position of assistant general manager of the Baltimore and Ohio under F. D. Underwood, who had recently been appointed general manager of the B. & O.

In May, 1901, Mr. Underwood, then vice president and general manager of the B. & O., became president of the Erie Railroad. Mr. Willard went with Mr. Underwood as his assistant, June, 1901. The same year he was elected first vice president and general manager of the Erie.

Mr. Willard remained with the Erie until January, 1904, when he resigned to become second vice president of the Chicago, Burlington and Quincy Railroad. He filled that position for six years and a part of the time was also vice president of the Denver, Texas and Forth Worth Railroad and president of the Colorado and Midland Railway. He resigned from the Burlington and associated companies in 1910 and became president of the Baltimore and Ohio, January 15 of that year.

In 1911 Mr. Willard was elected president of the American Railway Association and held that position two years.

In January, 1914, Mr. Willard was

elected a member of the Board of Trustees of the Johns Hopkins University in Baltimore, being elected president of the board April 20, 1926.

On October 30, 1916, Mr. Willard was appointed by President Wilson a member of the Advisory Commission of the Council of National Defense and later, he was elected chairman of the Commission, in which position he served during the period of the war.

On November 17, 1917, Mr. Willard was made chairman of the War Industries Board by President Wilson. He resigned on January 11, 1918, in order to devote his entire time to the management of the Baltimore and Ohio property.

In October, 1918, at the request of General Pershing, Mr. Willard was commissioned Colonel of Engineers, United States Army, with orders to proceed at once to France for service in the Transportation Section of the Engineering Corps, USA., but owing to the signing of the Armistice it was unnecessary for him to go.

On May 28, 1920, Mr. Willard was appointed Chairman, Advisory Committee, Association of Railway Executives.

On January 6, 1921, he was elected Chairman, Board of Directors, American Railway Association.

On April 30, 1929, he was awarded the gold medal of the National Institute of Social Sciences « in recognition of distinguished social services rendered through wise and far-seeing management of great corporate interests committed to your care ».

On January 13, 1930, the labor organizations operating on the B. & O., to mark his twentieth anniversary as president of the company, conferred upon him the honorary degree of « Doctor of Humanity ».

On June 22, 1933, Mr. Willard was elected Chairman of the Board of Directors of the Reading Company.

Mr. Willard was elected a member of the Board of Directors of the Association of American Railroads on September 21, 1934, and a member of its Executive Committee on September 12, 1934.

During the thirty-one years Willard was president of the B. & O. he was also most influential in shaping federal legislation affecting the railroads, and a highly respected witness in railroad hearings held by Congress and in important rate cases heard by the I. C. C.

Mr. Willard resigned as president of the B. & O., June 1, 1941, being succeeded by Roy B. White, and was made chairman of the board of directors.

His honorary academic distinctions were numerous and eminent.

The last public honor bestowed upon Mr. Willard was the Medal and Testimonial of La Salle College, Philadelphia, on April 24, 1942.

Mr. Willard was elected in 1924 a member of the Permanent Commission of the International Railway Congress Association. In spite of his many activities, he was always interested in our works and on many occasions he proved himself a faithful and devoted friend of our Association.

We wish to convey our sincerest sympathy to his family.

*The Executive Committee.*

# MONTHLY BIBLIOGRAPHY OF RAILWAYS[1]

*PUBLISHED UNDER THE SUPERVISION OF*

P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

**(SEPTEMBER 1946)**

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## I. — BOOKS.

### In French.

**946** **669 & 691**

**AYMANN (J.).**

**our protéger les métaux.**

'aris (6e), Dunod, éditeur, 92, rue Bonaparte. 1 vol. × 18 cm.) de IV-140 pages, avec 93 tableaux. (Prix: ché, 90 fr. français.)

---

**946** **621 .89**

**RTINET (P.).**

**e graissage des machines.**

'aris (6e), Dunod, éditeur, 92, rue Bonaparte. 1 vol. × 25 cm.) de IV-123 pages, avec 47 figures. (Prix: ché, 430 fr. français.)

---

**946** **625 .213**

**YNAL (C.).**

**es Ressorts.** Etude complète et méthode rapide de ul. 4e édition.

aris (6e), Dunod, éditeur, 92, rue Bonaparte. 1 vol. × 21 cm.) de XII-253 pages, 62 figures, 18 graphiques 12 tableaux. (Prix: broché, 265 fr. français.)

---

**946** **621 .7**

**LAND (A.).**

**uide théorique et formulaire pratique d'atelier pour riers, contremaîtres, chefs d'ateliers.** 3e édition.

aris, Girardot & Cie, édit., 1 volume (11 × 17 cm.) 250 pages.

### In English.

**1946** **385 .(09 .3 (.42)**

**BELL (R.).**

**History of the British Railways during the War 1939-1945.**

London, « The Railway Gazette », 33, Tothill Street, Westminster, S. W. 1. (Price: 25 sh.)

---

**1946** **621 .13 (09 (.42)**

**BURTT (F.).**

**L. B. and S. C. R. locomotives: A survey from 1870 to 1927.**

Staines, Ian Allan Limited, 225-7, Laleham Road. (Price: 3 sh. 6 d.)

---

**1946** **385**

**Lord MONKSWELL.**

**Railways and their future.**

London, E. C. 4, Ernest Benn Limited, Bouverie House, 154 Fleet Street. 7 1/4 × 5 in., 96 pages. (Price: 3 sh. 6 d. net.)

---

**1946** **385 .1 (.54) & 385 .3 (.54)**

**NATESAN (L. A.).**

**State management and control of Railways in India.**

Calcutta, published by the University of Calcutta. 10 × 6 1/2 in., 496 pages. (Price: Rs. 12.)

---

**1946** **385. (05 (.42)**

**THE RAILWAYMEN'S YEAR BOOK, 1946.** Edited by G. MORRIS.

London: The distributing agents for the publishers, Railwaymen's year book, 5-6, Red Lion Square, W. C. 1. (Price: 2 sh. 6 d.)

---

1) The numbers placed over the title of each book are those of the decimal classification proposed by the Railway Congress conly with the Office Bibliographique International, of Brussels. (See « Bibliographical Decimal Classification as applied to Railway ce », by L. WEISSENBRUCH, in the number for November 1897, of the *Bulletin of the International Railway Congress*, p. 1509).

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## II. — PERIODICALS.

### In French.

#### Annales des Ponts et Chaussées. (Paris.)

**1945** **624 .6**

Annales des Ponts et Chaussées, nov-déc., p. 589.
LANG (H.). — Etude sur les **voûtes de ponts.** (10 000 mots, tableaux & fig.)

**1945** **624 .2**

Annales des Ponts et Chaussées, nov.-déc., p. 664.
COPPEL (Th.). — **Système plan, à treillis en N,** articulé, chargé de bout (étude du **flambage**). (8 000 mots & fig.)

#### Annales des Travaux publics de Belgique. (Bruxelles.)

**1945** **624 .2**

Annales des travaux publics de Belgique, avril, p. 209.
BLANJEAN (L.). — Calcul d'une **poutre Vierendeel** de hauteur constante, dont les brides supérieure et inférieure sont identiques, soumise à des charges situées à l'aplomb des montants. (4 000 mots & fig.)

**1945** **721 .1**

Annales des travaux publics de Belgique, avril, p. 229; juin, p. 361 et août, p. 479.
DE BEER (E.-E.). — Etude des **fondations sur pilotis** et des **fondations directes.** L'appareil de pénétration en profondeur. (15 000 mots, tableaux & fig.)

**1945** **341 .3 (.493) & 623 (.493)**

Annales des travaux publics de Belgique, avril, p. 267.
Note sur l'état comparatif des **destructions de guerre du réseau** des Chemins de fer belges. (2 000 mots & fig.)

**1945** **721 .1**

Annales des travaux publics de Belgique, octobre, p. 569.
KEELHOFF (F.). — **Poutre** fléchie posée sur terrain élastique. (1 500 mots & fig.)

**1945** **691**

Annales des travaux publics de Belgique, octobre, p. 577.
COLLYNS (R.). — Etude expérimentale du fluage du **béton.** (4 500 mots & fig.)

#### Bulletin de la Société des Ingénieurs civils de France. (Paris.)

**1945** **669**

Bulletin de la Soc. des Ing. Civils de France (mémoires), fasc. nos 6, 7 et 8, juin-juillet-août. p. 292.
DUMAS (A.). — L'industrie des métaux non ferreux et particulièrement des **métaux légers.** (10 000 mots, tableaux & fig.)

**1945** **62. (01 & 669**

Bulletin de la Soc. des Ing. Civils de France (mémoires), fasc. nos 6, 7 et 8, juin-juillet-août. p. 344.
BASTIEN (P.). — Le problème physico-chimique de l'état des **surfaces métalliques.** (6 000 mots & fig.)

#### Bulletin des Transports internationaux par chemins de fer. (Berne.)

**1942** **385 .6**

Bull. des transp. intern. par ch. de fer, octobre, p. 406.
SCHEU. — La révision de l'article 6, § 4, de la **CIV** (3 000 mots.)

**1942** **385 .6 (0**

Bull. des transp. intern. par ch. de fer, novembre, p. 451.
Le **cinquantenaire de l'Office central.** Le 1er décembr 1942. (3 600 mots & tableau.)

**1942** **385 .6**

Bull. des transp. intern. par ch. de fer, novembre, p. 464.
HUBER (K.-A.). — Le **contrat de fourniture d wagons.** (2 700 mots.)

**1943** **385 .63 & 656 .237 .**

Bull. des transp. intern. par ch. de fer, janvier, p. 7.
WOZNANSKI (H.). — A propos de la **révision de C. I. M.** De la suppression du « monopole de déclaratio du chemin de fer ». (10 000 mots.)

**1943** **625 .245 (.494) & 656 .225 (.494**

Bull. des transp. intern. par ch. de fer, février, p. 73.
Cadres (containers) servant au transport de liquide et de marchandises en vrac **(containers-citernes).** (45 mots.)

**1943** **385 .63 & 656 .235**

Bull. des transp. intern. par ch. de fer, avril, p. 126.
EGER (G.). — A propos de la responsabilité encouru par le chemin de fer, en cas de calcul d'un **prix de trans port** trop réduit. (3 000 mots.)

**1943** **385 .113 (.439**

Bull. des transp. intern. par ch. de fer, avril, p. 162.
Les **Chemins de fer de l'Etat hongrois** en 1941. (80 mots.)

**1943** **625 .245 (.494) & 656 .225 (.494**

Bull. des transp. intern. par ch. de fer, avril, p. 165.
**Wagons spéciaux** pour grands containers. (400 mots.)

**1943** **656 .2**

Bull. des transp. intern. par ch. de fer, mai, p. 170.
Les obligations du chemin de fer en cas de **perte d marchandises à la suite de faits de guerre.** (1 300 mots

**1943** **385. (061 (.494) & 385 .6 (.494**

Bull. des transp. intern. par ch. de fer, mai, p. 194.
Extrait du **rapport de gestion** de la cinquantième anné (1942) de l'Office central des transports internationau par chemins de fer. (1 200 mots.)

**1943** **385 .6**

Bull. des transp. intern. par ch. de fer, juin, p. 202.
MOCCI (A.). — La suspension durant la guerre d actions dérivant du contrat de transport internationa (4 500 mots.)

**1943** **313 .385 (.494**

Bull. des transp. intern. par ch. de fer, juin, p. 238.
Les **Chemins de fer fédéraux suisses** en 1942. (T bleaux.)

**1943** **385 .62 & 385 .63**
l. des transp. intern. par ch. de fer, juillet, p. 246.
e NANASSY (B.). — Avant-projet d'une **Convention ernationale** concernant le droit de transport uniforme chemins de fer. (7 000 mots.)

**1943** **385 .63**
l. des transp. intern. par ch. de fer, août, p. 282.
CGER (G.). — A propos de la portée de l'article 5, b) de la **C. I. M.** (1 800 mots.)

**1943** **385 .113 (.494)**
l. des transp. intern. par ch. de fer, août, p. 306.
es **comptes et la gestion** des Chemins de fer fédéraux sses pour 1942. (1 200 mots.)

**1943** **385 .62 & 385 .63**
l. des transp. intern. par ch. de fer, sept., p. 318.
REYER (G.). — La **publication des dispositions tari- es** en matière de transports internationaux (3 000 s.)

**1943** **351 .757 (.44)**
l. des transp. intern. par ch. de fer (annexe), sep- tembre, p. 85; octobre, p. 93; novembre, p. 105; décembre, p. 117.
Décret du 22 mars 1942, portant règlement d'adminis- tion publique sur **la police, la sûreté et l'exploitation voies ferrées** d'intérêt général et d'intérêt local ance). (11 000 mots.)

## Bulletin technique de la Suisse romande. (Lausanne.)

**1945** **625 .13**
. techn. de la Suisse romande, 20 janvier, p. 2 et 17 février, p. 4.
TT (J.-C.). — Quelques aspects du problème de la ssée sur les **tunnels.** (14 000 mots, tabl. & fig.)

**1945** **651 (.494)**
. techn. de la Suisse romande, 3 février, p. 38.
es nouvelles **installations de bureaux** des Chemins de fédéraux. (800 mots.)

**1945** **621 .338 (.494)**
. techn. de la Suisse romande, 9 juin, p. 165.
es **nouvelles voitures** de la ligne du Brunig. (700 s.)

**1945** **62. (01 & 691**
. techn. de la Suisse romande, 28 juillet, p. 206.
OLOMEY (J.). — Recherches et essais sur les **bétons.** prises et problèmes rencontrés au cours des travaux Barberine. (5 000 mots.)

**1945** **721 .1**
. techn. de la Suisse romande, 28 juillet, p. 211.
ARIS (A.). — **Poutres formant radier** sur sol com- sible. (6 000 mots & fig.)

**1945** **62. (01 & 691**
. techn. de la Suisse romande, 1er septembre, p. 257.
ssociation suisse pour l'essai des matériaux. Résultats **essais de béton** précontraint effectués de 1941 à 1945 le laboratoire fédéral d'essais des matériaux. (1 500 .)

## Génie Civil. (Paris.)

**1942** **624 .63**
Génie Civil, nº 3093, 15 septembre, p. 253; nº 3094, 1er octobre, p. 269.
LOSSIER (H.). — Types de **ponts en béton armé** avec armatures précontraintes réglables. (6 500 mots & fig.)

**1942** **656 .223 .2 (.44)**
Génie Civil, nº 3094, 1er octobre, p. 273.
La **réduction de l'immobilisation du matériel** de chemin de fer à la S. N. C. F. (2 000 mots & fig.)

**1942** **62. (01 & 691**
Génie Civil, nº 3095, 15 octobre, p. 277.
GELLUSSEAU (L.). — Nouveaux abaques pour le **calcul du béton armé.** (2 500 mots & fig.)

**1942** **621 .33 : 625 .62**
Génie Civil, nº 3095, 15 octobre, p. 282.
MEYER (C.). — Nouveaux types de **prise de courant pour tramways** et autobus électriques. (1 000 mots & fig.)

**1942** **621 .392 & 665 .882**
Génie Civil, nº 3096, 1er novembre, p. 294.
La **soudure.** Conférences faites au Salon technique et industriel allemand (Paris, 20 et 21 octobre 1942). (2 500 mots.)

**1942** **624 .63**
Génie Civil, nº 3096, 1er novembre, p. 298.
FREYSSINET (E.). — **L'emploi d'armatures précon- traintes réglables** dans les constructions en béton armé. (Réponse à l'article de M. H. Lossier paru dans les numéros des 15 septembre et 1er octobre 1942 du « Génie Civil ». (700 mots.)

**1942** **624 .63 (.485)**
Génie Civil, nº 3098, 1er décembre, p. 319.
Les causes de l'effondrement du cintre du **pont en béton armé** de Sandö, sur le fleuve Angerman, en Suède. (1 000 mots & fig.)

**1943** **621 .431 .72 (.593)**
Génie Civil, nº 3100, 1er janvier, p. 1.
DUMAS (J.). — Les nouvelles **locomotives Diesel- électriques** de 735 ch. des Chemins de fer de l'Etat thaï- landais. (4 000 mots, 2 tableaux & fig.)

**1943** **621 .433**
Génie Civil, nº 3100, 1er janvier, p. 6.
BERTHELOT (Ch.). — **L'épuration du gaz de gazo- gène.** (1 600 mots & fig.)

**1943** **624 .63 (.44)**
Génie Civil, nº 3101, 15 janvier, p. 1; nº 3102, 1er février, p. 25.
MACAREZ (J.). — Le nouveau **pont** de Neuilly sur la Seine. (12 000 mots & fig.)

**1943** **621 .433 (.44) & 662 (.44)**
Génie Civil, nº 3102, 1er février, p. 29.
Le choix du **combustible pour gazogènes.** (1 600 mots.)

**1943** **629 .113 .62 (.44)**
Génie Civil, nº 3103, 15 février, p. 37.
Les nouveaux **trolleybus** de la région parisienne. (4 200 mots & fig.)

**1943** **536**
Génie Civil, n° 3103, 15 février, p. 40; n° 3104, 1er mars, p. 52.
VILLEY (J.). — La signification des **principes de la thermodynamique.** (6 500 mots.)

**1943** **621 .433 (.44) & 662 (.44)**
Génie Civil, n° 3103, 15 février, p. 44.
Les **carburants solides pour gazogènes.** (2 000 mots.)

**1943** **621 .93 & 621 .98**
Génie Civil, n° 3104, 1er mars, p. 49.
Les **outils de coupe** de grande dureté et leur **affûtage.** (3 100 mots & fig.)

**1943** **621 .436**
Génie Civil, n° 3104, 1er mars, p. 53.
Les progrès dans la construction des **moteurs Diesel à deux temps.** (2 800 mots & fig.)

## Revue de l'Association française des Amis des Chemins de fer. (Paris.)

**1945** **621 .131**
Revue de l'Assoc. franç. des amis des Ch. de fer, janvier-février, p. 9.
CAIRE (D.) & Baron VUILLET. — Le problème de la **locomotive mixte.** (2 000 mots & fig.)

**1945** **621 .335 (.44)**
Revue de l'Assoc. franç. des amis des Ch. de fer, janvier-février, p. 16; mars-avril, p. 41.
GACHE (A.). — Réalisations récentes de **matériel roulant électrique** à la S. N. C. F. (2 500 mots, tableaux & fig.)

**1945** **621 .132 .5 (.44)**
Revue de l'Assoc. franç. des amis des Ch. de fer, mars-avril, p. 25.
Baron VUILLET & CAIRE (D.). — La nouvelle **locomotive 150 X** de la S. N. C. F. (1 200 mots & fig.)

**1945** **625 .232 (.44)**
Revue de l'Assoc. franç. des amis des Ch. de fer, mars-avril, p. 33.
BEGUE (A.). — Les **voitures spéciales** de la S. N. C. F. (2 000 mots & fig.)

**1945** **621 .132 .3 (.44) & 621 .132 .5 (.44)**
Revue de l'Assoc. franç. des amis des Ch. de fer, mai-juin, p. 57.
VILAIN (L.-M.). — L'évolution des **locomotives mixtes** ou marchandises-voyageurs à la Compagnie du Midi. (3 000 mots, tableau & fig.)

**1945** **621 .132 .1 (.73)**
Revue de l'Assoc. franç. des amis des Ch. de fer, juillet-août, p. 77.
Baron VUILLET & CAIRE (D.). — Les **locomotives américaines récentes** et leurs performances en service courant (1941-1945). (6 000 mots & fig.)

**1945** **621. 13 (.44)**
Revue de l'Assoc. franç. des amis des Ch. de fer, septembre-décembre, p. 97.
CHAPELON (A.). — Les projets d'avenir en **traction à vapeur** de la S. N. C. F. (7 000 mots & fig.)

**1945** **621 .335 : 625 .62 (.493**
Revue de l'Assoc. franç. des amis des Ch. de fer, se tembre-décembre, p. 116.
DAUBESSE (J.). — Un essai d'**automotrice électriq légère** à la S. N. C. V. (1 000 mots & fig.)

**1945** **621 .335 (.4**
Revue de l'Assoc. franç. des amis des Ch. de fer, se tembre-décembre, p. 119.
GACHE (A.). — Le **matériel roulant électrique** construction pour la S. N. C. F. (5 000 mots & fig.)

## Revue générale des chemins de fer. (Paris.)

**1943** **621 .132 .3 (.44) & 621 .132 .5 (.4**
Revue générale des chemins de fer, n° 2, mars-avr p. 25.
LEGRAND (Y.). — **Nouvelle locomotive à vape type Mikado,** série 141-P de la S. N. C. F. (8 000 mo tableaux & fig.)

**1943** **656 .223 .1 (.**
Revue générale des chemins de fer, n° 2, mars-av p. 42.
LARTILLEUX. — L'**emploi du matériel à voyage** sur la S. N. C. F. (2 000 mots & fig.)

**1943** **625 .244 (.44) & 656 .225 (.**
Revue générale des chemins de fer, n° 2, mars-av p. 44.
TEXTE. — L'activité des **transports frigorifiques** leur adaptation aux nécessités du ravitaillement. (1 mots & tableau.)

**1943** **621 .33 (.**
Revue générale des chemins de fer, n° 3, mai-juin, p. L'**électrification** de la ligne Paris-Lyon. État ac des études. (15 000 mots & fig.)

**1943** **656 .223 .1 (.**
Revue générale des chemins de fer, n° 3, mai-juin, p.
MARTEAU. — Organisation du **contrôle par fiches matériel à voyageurs** sur la Région du Sud-Est. (3 mots & fig.)

**1943** **385 .51 (.44) & 385 .58 (.**
Revue générale des chemins de fer, n° 3, mai-juin, p.
Le **statut social du personnel** de la S. N. C. F. (4 mots.)

**1943** **621 .13**
Revue générale des chemins de fer, n° 4. juillet-a p. 73.
ARMAND. — L'**entartrement des chaudières** de l motives à vapeur. Causes et effets. (14 000 mots, tabl & fig.)

**1943** **385 .585 (**
Revue générale des chemins de fer, n° 4, juillet-a p. 91.
GEOFFROY. — Les **bibliothèques** des Services soc de la S. N. C. F. (1 700 mots, tableau & fig.)

**1943** **385 .517 .4 (**
Revue générale des chemins de fer, n° 4, juillet-a p. 94.
Mesures prises depuis l'armistice en vue d'amél les conditions d'alimentation et de **ravitaillement personnel** de la S. N. C. F. (2 000 mots & tableau.)

**1943** **621 .33**
evue générale des chemins de fer, n° 4, juillet-août, p. 96.
TUJA. — L'étude d'une **électrification** en fonction du afic. (300 mots.)

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**1943** **385 .587 (.44) & 621 .137 (.44)**
evue générale des chemins de fer, n° 4, juillet-août, p. 97.
PONCET. — Le problème de l'**utilisation des locomo-ves.** (400 mots.)

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**1943** **621 .13 ,621 .33 & 621 .43**
evue générale des chemins de fer, n° 4, juillet-août, p. 97.
DUGAS. — Comparaison des différentes sources d'éner-e au point de vue de leur utilisation à la **traction.** 00 mots.)

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**1943** **621 .33 (.485)**
evue générale des chemins de fer, n° 4, juillet-août, p. 99.
**L'électrification** des Chemins de fer suédois. (800 mots tableau.)

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**1943** **621 .132 .8 (.44)**
vue générale des chemins de fer, n° 5, septembre-oct., p. 101.
CHAN. — **Locomotive à haute pression à moteurs lividuels,** type 232-P de la S. N. C. F. (4 500 mots fig.)

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**1943** **385 .517 .6 (.44)**
vue générale des chemins de fer, n° 5, septembre-oct., p. 109.
Drs. BIDERMANN, ALIBERT, MERY & PAILLAS. **Dépistage de la tuberculose pulmonaire** sur la région l'Est de la S. N. C. F., au moyen des examens radio-iques systématiques. (3 500 mots, tableaux & fig.)

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**1943** **656 .225 (.44)**
vue générale des chemins de fer, n° 5, septembre-oct., p. 114.
BRONNER. — Le **ravitaillement de Paris par chemin fer** en 1942. (3 500 mots.)

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**1943** **613 .66 (.44) & 656 .28 (.44)**
vue générale des chemins de fer, n° 5, septembre-oct., p. 118.
LEAUVOIS. — La **prévention des accidents du travail** S. N. C. F. (4 000 mots & fig.)

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**1943** **654 (.44)**
ue générale des chemins de fer, n° 5, septembre-oct., p. 124.
**nstallations téléphoniques** du service de renseignements aris-Austerlitz. (700 mots & fig.)

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## La Technique moderne. (Paris.)

**1946** **621 .431 .72 (.73)**
Technique moderne, n$^{os}$ 11 et 12, 1$^{er}$ et 15 juin, p. 131.
**ocomotives Diesel américaines.** (600 mots.)

## In German.

## Archiv für Eisenbahnwesen. (Berlin.)

**1942** **625 .111 (.66)**
Archiv für Eisenbahnwesen, März/April, S. 157.
REMY. — Der französische Standpunkt zu einem **Bahnbau** Duala-Tschadsee. (27 000 Wörter & Abb.-Karten.)

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**1942** **656**
Archiv für Eisenbahnwesen, März/April, S. 223.
REITSMA (S. A.). — Die Rentabilitätsfrage bei **kolonialen Verkehrsmitteln.** (32 000 Wörter, Tafeln & Abb.)

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**1942** **385 (.09 (.6)**
Archiv für Eisenbahnwesen, März/April, S. 297.
WERNEKKE. — **Kap-Kairo.** (12 000 Wörter & Karte.)

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**1942** **625 .162 & 656 .254**
Archiv für Eisenbahnwesen, Mai/Juni, S. 357.
FINGER. — Die **Kreuzung von Schienenbahnen** mit anderen Verkehrswegen. (25 000 Wörter.)

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**1942** **385 (.494)**
Archiv für Eisenbahnwesen, Mai/Juni, S. 411.
KUNTZEMÜLLER (A.). — Die **Eisenbahnpolitik** von Bund und Kantonen in der Schweiz. (23 000 Wörter.)

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**1942** **656 .225 (.82) & 656 .235 .5 (.82)**
Archiv für Eisenbahnwesen, Mai/Juni, S. 457.
WERNEKKE. — **Getreideverkehr** in Argentinien. (6 000 Wörter & Karte.)

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**1942** **623 (.44 + .493)**
Archiv für Eisenbahnwesen, Juli/August, S. 505.
JANECKE (L.). — **Eisenbahnbetrieb** auf den Bahnen in Belgien und Frankreich **während des Weltkrieges 1914-18.** (26 000 Wörter, 3 Tabellen & 4 Karten.)

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**1942** **385. (09 (.86)**
Archiv für Eisenbahnwesen, Juli/August, S. 585.
PASCHEN (W.). — Das **Verkehrswesen** Kolumbiens. (12 000 Wörter, Tabellen & 2 Karten.)

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## Der Bahn-Ingenieur. (Berlin.)

**1940** **621 .135 .2 (.43) & 625 .214 (.43)**
Der Bahn-Ingenieur, Nr. 44, 3. November, S. 545.
BACKOF (H.). — Die Bedeutung des **Druckgiesverfahrens** bei der Herstellung dünner **Lagerausgüsse.** (1 200 Wörter & Abb.)

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**1940** **625 .144 .4 (.43)**
Der Bahn-Ingenieur, Nr. 44, 3. November, S. 549.
SCHMITZ (H.). — Absteckungsübersicht zum **Vermarken der Gleise.** (400 Wörter & Abb.)

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**1940** **625 .144**
Der Bahn-Ingenieur, Nr. 44, 3. November, S. 551.
SCHAFFER. — Zusatzeinrichtung zur **Pfeilhöhenprüfung.** (250 Wörter & Abb.)

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**1940** **625 .113**
Der Bahn-Ingenieur, Nr. 45, 10. November, S. 557.
HANNIG. — Die Berechnung von **Korbbogen.** (1 700 Wörter & Abb.)

**1940** **669 .1 & 691**
Der Bahn-Ingenieur, Nr. 45, 10. November, S. 562.
**Stahl wird gespritzt.** (1 300 Wörter & Abb.)

**1940** **621 .138 .5 (.43) & 625 .26 (.43)**
Der Bahn-Ingenieur, Nr. 46, 17. November, S. 569.
DULIAS. — **Sauerstoffanlagen** in Reichsbahn-Ausbesserungswerken. (6 800 Wörter & Abb.)

**1940** **625 .113 (.43)**
Der Bahn-Ingenieur, Nr. 47, 24. November, S. 585.
WARNICK (A.). — **Bogenwechsel** ohne Übergangsbogen sowie Gegenbogen ohne Übergangsbogen und Zwischengerade nach den neuen Oberbauvorschriften. (2 000 Wörter & 3 Tafeln.)

**1940** **625 .143 .3**
Der Bahn-Ingenieur, Nr. 48, 1. Dezember, S. 597.
ZIMMERMANN (K.). — **Radschleuderstellen an Schienen.** (2 400 Wörter & Abb.)

**1940** **621 .138 .5 (.438) & 625. 26 (.438)**
Der Bahn-Ingenieur, Nr. 49, 8. Dezember, S. 609.
STIER (M.). — Die **Fahrzeugerhaltung** der früheren polnischen Staatsbahn. (1 500 Wörter & Tafeln.)

**1940** **621 .335 (.43)**
Der Bahn-Ingenieur, Nr. 50, 15. Dezember, S. 627.
CURTIUS (E. W.). — Ein neuer **Messwagen.** (1 600 Wörter & Abb.)

**1940** **625 .216 (.43)**
Der Bahn-Ingenieur, Nr. 50, 15. Dezember, S. 630.
SCHATTE (L.). — Die neuentwickelten **Hülsenpuffer** für Reichsbahnfahrzeuge. (500 Wörter & Abb.)

**1940** **669**
Der Bahn-Ingenieur, Nr. 51/52, 22. Dezember, S. 637.
BILFINGER (R.). — Die technische **Hartverchromung.** Ihre Besonderheiten, Anwendungsgebiete und Arbeitstechnik. (2 500 Wörter & Abb.)

**1940** **624. (0**
Der Bahn-Ingenieur, Nr. 51/52, 22. Dezember, S. 642.
MORGENROTH (F.). — **Brückenmesstechnik.** (1 100 Wörter & Abb.)

**1941** **621 .134 .1**
Der Bahn-Ingenieur, Nr. 1, 5. Januar, S. 10.
GRÜNDLER. — Ein **Kreuzkopf** mit verstellbaren Gleitplatten. (1 200 Wörter & Abb.)

**1941** **621 .138 .3 (.43)**
Der Bahn-Ingenieur, Nr. 2, 12. Januar, S. 17.
WILL. — Betriebswinke. Aus dem **Arbeitsgebiet eines Bahnbetriebswerkes.** (1 200 Wörter & Abb.)

**1941** **625 .144 .4**
Der Bahn-Ingenieur, Nr. 3, 19. Januar, S. 29; Nr. 4, 26. Januar, S. 41.
MODERO. — Die **Festpunktnachweisung.** (2 000 Wörter & Abb.)

**1941** **669 & 691**
Der Bahn-Ingenieur, Nr. 3, 19. Januar, S. 36.
SCHMIDT (M.). — Die **Hartverchromung,** ein Verfahren zur Instandsetzung abgenutzter Maschinenteile. (1 300 Wörter & Abb.)

**1941** **625 .144**
Der Bahn-Ingenieur, Nr. 5, 2. Februar, S. 53.
HÖFER. — Der Bedarf an **Ausgleichschienen für Gle**
**bogen.** (2 400 Wörter & 2 Tafeln.)

## Elektrische Bahnen. (Berlin.)

**1942** **621 .33 & 656 .222**
Elektrische Bahnen, Heft 3, März, S. 45.
KOTHER (H.). — Voruntersuchungen zum **elekt**
**schen Zugbetrieb auf Fernschnellbahnen.** (12 000 Wört
Tafeln & Abb.)

**1942** **621 .3**
Elektrische Bahnen, Heft 3, März, S. 65; Heft 5, M
S. 112.
FRAUNHOLZ (J.). — Verschmutzungsversuche
**Fahrleitungsisolatoren** der Deutschen Reichsbahn. (1
Wörter & Abb.)

**1942** **625 .2**
Elektrische Bahnen, Heft 4, April, S. 67; Heft 5, M
S. 103.
TASCHINGER (O.). — Die Entwicklung der **Stre**
**linienform von Schnelltriebwagen.** (27 000 Wörter, Ta
len & Abb.)

**1942** **621 .**
Elektrische Bahnen, Heft 6, Juni, S. 132.
LANDMANN (K. W.). — Ein neuer **Akkumula**
**elektrischer Triebzug.** (5 000 Wörter & Abb.)

**1942** **621 .335 &**
Elektrische Bahnen, Heft 7, Juli, S. 139.
KNIFFLER (A.). — **Der Leichtbau elektrischer Tr**
**fahrzeuge,** seine Notwendigkeit und Verwirklich
(4 500 Wörter & Abb.)

**1942** **621 .135 .4, 625 .14 (01 & 625**
Elektrische Bahnen, Heft 7, Juli, S. 146.
OTTOSSON (J.). — Um die **Haftung.** (4 500 Wö
Zusammenstellungen & Abb.)

**1942** **621 .33 (**
Elektrische Bahnen, Heft 7, Juli, S. 152.
CORBELLINI (G.) & DIEGOLI (M.). — **Energie**
**brauch** der elektrischen Züge auf dem Gleichstrom
der Italienischen Staatsbahnen. (1 500 Wörter & A

**1942** **621 .33 (**
Elektrische Bahnen, Heft 7, Juli, S. 155.
KRIENITZ (G.). — Die **elektrische Zugförderun**
den UdSSR. (1 200 Wörter & Karte.)

## Glasers Annalen. (Berlin.)

**1941** **621 .135**
Glasers Annalen, Heft 12, 15. Juni, S. 191.
SCHÖNING (F. W.). — Die günstigste Form
**Radgegengewichte** bei Lokomotiven. (2 000 W
& Abb.)

**1941** **62. (01 & 621**
Glasers Annalen, Heft 13, 1. Juli, S. 199; Hef
15. Juli, S. 207.
HÄNCHEN (R.). — Berechnung der **Schweis**
**struktionen** auf Dauerhaltbarkeit. (7 000 Wörter & A

**1941** **625 .232 (.43)**
lasers Annalen, Heft 15, 1. August, S. 217.
Neue **Schlafwagen** der Mitropa. (1 800 Wörter & Abb.)

**1941** **621 .133 .7**
lasers Annalen, Heft 16, 15. August, S. 225.
PETERS (H.). — **Heissdampf-statt Sattdampf-Antrieb** ir Lokomotiv-Kolbenpumpen. (2 000 Wörter & Abb.)

**1941** **621 .135 .(01**
lasers Annalen, Heft 17, 1. September, S. 233.
SCHOENING (F. W.). — Über **Zuckschwingungen** an ampflokomotiven. (6 000 Wörter & Abb.)

**1941** **656 .285 (.43)**
lasers Annalen, Heft 18, 15. September, S. 243.
MARTENS (H. A.). — Verdunkelung und **Unfall-erhütung** bei der Reichsbahn. (3 000 Wörter & Abb.)

**1941** **62. (01 & 669 .1**
lasers Annalen, Heft 18, 15. September, S. 246.
FRANK (K. Jr.). — Zeitgemässe **Härteprüfung.** 2 000 Wörter, 1 Tabelle & Abb.)

**1941** **625 .2 : 625 .62 (.43)**
lasers Annalen, Heft 19, 1. Oktober, S. 251.
SCHMELZER. — Neue **Strassenbahn-Trieb-und-Bei-agen** der Berliner Verkehrsbetriebe (BVG). (1 900 örter & Abb.)

**1941** **621 .335 (.494)**
lasers Annalen, Heft 20, 15. Oktober, S. 261.
SCHMELZER. — **Elektrische Grosslokomotiven** der chweizer Bundesbahnen. (1 800 Wörter & Abb.)

**1941** **621 .132 .3 & 621 .134 .4**
lasers Annalen, Heft 21, 1. November, S. 269.
SCHÖNING (P. & F. W.). — **2 C 1-h 2 m v-Lok** (Mit-nzylinderverbundlok.). (2 000 Wörter, 1 Zusammen-ellung & Abb.)

**1941** **625 .234 & 669**
asers Annalen, Heft 21, 1. November, S. 273.
**Leichtmetall für die Heizanlage** von Eisenbahnwagen. 00 Wörter.)

**1941** **621 .335 (.494) & 625 .3 (.494)**
asers Annalen, Heft 22, 15. November, S. 277.
SCHMELZER (K.). — **Elektrische Triebwagen** für hnradbahnen. (2 600 Wörter & Abb.)

**1941** **621 .135. (01 & 625 .14 (01**
asers Annalen, Heft 23, 1. Dezember, S. 289; Heft 24, 15. Dezember, S. 316.
NORDMANN. — Die **Reibung zwischen Rad und hiene** bei der Lokomotive. (12 000 Wörter, 4 Zusam-nstellungen & Abb.)

**1941** **625 .242**
asers Annalen, Heft 23, 1. Dezember, S. 298.
UTHER. — Erhöhung der Leistungsfähigkeit **zwei-siger offener Güterwagen.** (4 200 Wörter & Abb.)

**1942** **621 .133 .7**
sers Annalen, Heft 1, 1. Januar, S. 1.
KREBBA (H.). — **Lokomotivkesselspeisung** mit der ien Knorr-Mischvorwärmanlage. (3 600 Wörter bb.)

**1942** **621 .335 (.43)**
Glasers Annalen, Heft 2, 15. Januar, S. 9; Heft 3, 1. Februar, S. 20.
TETZLAFF (H.). — Fünf Jahre **deutscher elektrischer Lokomotivbau.** (7 500 Wörter & Abb.)

**1942** **625 .617 (.6)**
Glasers Annalen, Heft 5, 1. März, S. 39.
SCHROETER (H.). — Die **Güter- und Personenwagen** der deutschen Kolonialbahnen. (3 000 Wörter, 2 Zahlentafeln & Abb.)

**1942** **385. (09 (.56)**
Glasers Annalen, Heft 6, 15. März, S. 51.
WERNEKKE. — Die **Bagdad-Eisenbahn.** (4 500 Wörter & Abb.)

## Gleistechnik und Fahrbahnbau. (Karlsruhe.)

**1943** **656 .211 & 656 .222 .5**
Gleistechnik und Fahrbahnbau, Heft Nr. 13/18, 15. August, S. 35; Heft Nr. 19/24, 15. November, S. 43.
FEINDLER (R.) & BREDOW (H.). — Ablauf und Abstoss bei der **Umbildung von Reisezügen.** (9 000 Wörter, Tafeln & Abb.)

**1943** **625 .14 (01**
Gleistechnik und Fahrbahnbau, Heft Nr. 19/24, 15. November, S. 49.
PÖSENTRUP (H.). — Beitrag zur **Berechnung des Oberbaues.** (900 Wörter & Abb.)

**1944** **625 .13**
Gleistechnik und Fahrbahnbau, Heft Nr. 1/6, 15. Februar, S. 1; Heft Nr. 7/12, 15. Mai, S. 9.
BÄSELER. — Zur Frage des Gleisbogens. (5 000 Wörter & Abb.)

## Die Lokomotive. (Bielefeld-Berlin.)

**1941** **621 .132 .3 (.481) & 621 .134 .4 (.481)**
Die Lokomotive, Nr. 9, September, S. 135.
STORSAND (O.). — **1' D 2'-Vierzylinder-Heissdampf-Verbund-Lokomotive** der Norwegischen Staatsbahnen. (3 500 Wörter, 1 Tafel & Abb.)

**1941** **625 .6 (.43)**
Die Lokomotive, Nr. 9, September, S. 141.
von GALLERA (J.). — Die deutschen **Privat- und Kleinbahnen** und ihre Betriebsmittel. (4 000 Wörter.)

**1941** **621 .133 .3 & 621 .134 .4**
Die Lokomotive, Nr. 10, Oktober, S. 153.
NORDMANN. — **Heissdampf und Verbundwirkung.** Versuche an einer norwegischen Vierzylinder-Verbund-Schnellzug-Lokomotive. (11 000 Wörter & 6 Zusammenstellungen.)

**1941** **385 .15 (.460)**
Die Lokomotive, Nr. 10, Oktober, S. 165.
REDER (G.). — Die **Verstaatlichung** der spanischen Eisenbahnen. (2 000 Wörter.)

**1941** **625 .212 & 625 .215**
Die Lokomotive, Nr. 11, November, S. 169.
BÄSELER. — Die statischen Grundlagen des **Minimumsatzes von Heumann.** (5 500 Wörter & Abb.)

**1941** **621 .133 .2**

Die Lokomotive, Nr. 12, Dezember, S. 183.
HERZFELD (K.). — Beobachtungen während des **Anheizens eines Lokomotivkessels.** (2 500 Wörter & Abb.)

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**1941** **621 .13**

Die Lokomotive, Nr. 12, Dezember, S. 187.
NEESEN (F.). — Die **Lokomotive** im Bilde des zukünftigen Eisenbahnverkehrs. (3 000 Wörter & Abb.)

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**1942** **621 .135 .4 & 625 .215**

Die Lokomotive, Nr. 1, Januar, S. 1; Nr. 2, Februar, S. 20.
HEUMANN. — **Grundzüge des Bogenlaufs** von Eisenbahnfahrzeugen. (7 000 Wörter & Abb.)

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**1942** **621 .133 .2**

Die Lokomotive, Nr. 2, Februar, S. 17.
MEYER (E.). — Bau und Behandlung der **Stahlfeuerbüchsen** für Lokomotiven. (2 000 Wörter & Abb.)

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**1942** **621 .13 & 621 .431 .72**

Die Lokomotive, Nr. 3, März, S. 37.
SCHNEIDER (L.). — **Dampf- und Diesel-Triebfahrzeuge** im Fern- und Schwerverkehr. (5 500 Wörter & Abb.)

---

**1942** **621 .135 .1**

Die Lokomotive, Nr. 3, März, S. 44; Nr. 4, April, S. 61.
LÜTTGERDING (H.). — Biegespannungen und Kräfte im **Lokomotiv-Barrenrahmen** beim Anheben der Maschine ohne und mit Radsätzen. (9 000 Wörter, 2 Tafeln & Abb.)

---

**1942** **621 .13 (.47)**

Die Lokomotive, Nr. 4, April, S. 53.
METZELTIN. — Russischer **Lokomotivbau.** (6 000 Wörter, Zusammenstellungen & Karte.)

---

**1942** **621 .133 .5**

Die Lokomotive, Nr. 5, Mai, S. 71.
KOCH (K.). — Grundlagen zur Berechnung von **Saugzuganlagen für Dampflokomotiven** nach praktisch bewährten Erfahrungswerken. (3 800 Wörter & Abb.)

---

**1942** **621 .335**

Die Lokomotive, Nr. 5, Mai, S. 76.
LANDMANN (K. W.). — Die **elektrische Verschiebe-Lokomotive** im Rahmen der Kraftstoffwirtschaft und deren Neuordnung. (8 000 Wörter & Abb.)

---

## Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

**1941** **621 .132 .1 (.43)**

Organ für die Fortschritte des Eisenbahnwesens, Heft 6, 15. März, S. 91.
LÜBSEN (W.). — **Neuere Lokomotiven** der Elsass-Lothringischen Eisenbahnen. (1 000 Wörter & Abb.)

---

**1941** **621 .13 (.436)**

Organ für die Fortschritte des Eisenbahnwesens, Heft 7, 1. April, S. 97.
LEHNER (A.). — Die **Entwicklung des österreichischen Lokomotivbaues** in den letzten vier Jahrzehnten. (9 000 Wörter & Abb.)

**1941** **625 .21**

Organ für die Fortschritte des Eisenbahnwesens, Heft 7
1. April, S. 105.
KALL (H.). — **Höchstgeschwindigkeiten für Drehgestellwagen in Gleisbögen** ohne Übergangsbögen. (3 80
Wörter & Abb.)

---

**1941** **669 .1 (.43**

Organ für die Fortschritte des Eisenbahnwesens, Heft 8
15. April, S. 113.
KÜHNEL (R.). — Normung und Entwicklung de
**Konstruktions- und Baustähle** bei der Deutschen Reich
bahn und ihre Grenzen. (5 000 Wörter & Abb.)

---

**1941** **621 .133**

Organ für die Fortschritte des Eisenbahnwesens, Heft
15. April, S. 118.
URBANEK (J.). — Undichte **Stehbolzen** in kupfern
Feuerbüchsen. (1 400 Wörter & Abb.)

---

**1941** **656 .222**

Organ für die Fortschritte des Eisenbahnwesens, Heft
15. April, S. 120.
POTTHOFF (G.). — Fehler bei den **zeichnerisch**
**Fahrzeitermittlungen.** (4 500 Wörter & Abb.)

---

**1941** **621 .131 .3 & 621 .135. (**

Organ für die Fortschritte des Eisenbahnwesens, H
9/10, 1. Mai, S. 129.
NORDMANN. — Die **Laufeigenschaften der Lokom**
**tiven.** Versuchsmässige Feststellungen mit dem **Oszil**
**graphenwagen** der Deutschen Reichsbahn. (22 000 W
ter, 7 Tafeln & Abb.)

---

**1941** **625 .42 (.4**

Organ für die Fortschritte des Eisenbahnwesens, Heft
1. Juni, S. 161.
KUHNKE. — Die Baugrubenaussteifung für **Unt**
**grundbahntunnel** nach der Berliner Bauweise. (10
Wörter, Tafeln & Abb.)

---

**1941** **625**

Organ für die Fortschritte des Eisenbahnwesens, Heft
15. Juni, S. 177.
HELBERG (W.) & SPERLING. — Verfahren
Beurteilung der **Laufeigenschaften von Eisenbahnwag**
(7 800 Wörter, Zahlentafeln & Abb.)

---

**1941** **625 .143**

Organ für die Forstchritte des Eisenbahnwesens, Heft
15. Juni, S. 189.
WATTMANN. — **Verbundschienen** und ihre W
schaftlichkeit. (2 300 Wörter, 1 Zahlentafel & Abb.)

---

**1941** **621 .135 .4 & 625**

Organ für die Fortschritte des Eisenbahnwesens, Heft
1. Juli, S. 193.
MÜLLER (C. Th.). — **Laufsicherheitsprüfung** bei
Deutschen Reichsbahn. (10 000 Wörter & Abb.)

---

**1941** **621 .135 .4 & 625**

Organ für die Fortschritte des Eisenbahnwesens, Heft
15. Juli, S. 209.
HEUMANN. — Das Minimumverfahren der **Bogenl**
**untersuchung** und seine Anwendung auf Verschubach
(3 000 Wörter & Abb.)

**1941** **656 .212 .5**

rgan für die Fortschritte des Eisenbahnwesens, Heft 14, 15. Juli, S. 214.
POTTHOFF (G.). — Beitrag zur **Fahrzeitberechnung** i **Abstossbetrieb.** (1 500 Wörter & Abb.)

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**1941** **385. (09 (.481)**

rgan für die Fortschritte des Eisenbahnwesens, Heft 15, 1. August, S. 225.
WERNEKKE. — Die **Norwegischen Eisenbahnen.** 000 Wörter & Karte.)

---

**1941** **625 .162 & 656 .254**

rgan für die Fortschritte des Eisenbahnwesens, Heft 15, 1. August, S. 231.
BIESOK. — **Selbsttätige Warnlichtanlagen an Weg**ergängen auf eingleisigen Strecken der Ostmark. 200 Wörter.)

---

**1941** **625 .142 .2**

rgan für die Fortschritte des Eisenbahnwesens, Heft 15, 1. August, S. 233.
SALLER (H.). — Die **zusammengesetzte Eisenbahn**erschwelle. (2 600 Wörter & Abb.)

---

## Die Reichsbahn. (Berlin.)

**1942** **656 .231**

e Reichsbahn, Heft 38/39, 23./30. September, S. 298.
PFIZER. — **Tarifvereinfachung.** (8 500 Wörter.)

---

**1942** **656 .211 .5**

e Reichsbahn, Heft 42/43, 21./28. Oktober, S. 329; Heft 48/49, 2./9. Dezember, S. 383.
GILDEMEISTER (W.). — Die Rangierarbeitszeiten der Ordnungsgruppe der **Abstellbahnhöfe.** (12 000 örter & Abb.)

---

**1942** **625 .174 (.43)**

e Reichsbahn, Heft 44/45, 4./11. November, S. 353.
KRETSCHMAR (E.). — **Schneeschutz** an Verkehrsgen: Ein Problem ? (4 500 Wörter.)

---

**1942** **625 .172 (.44 + .493)**

e Reichsbahn, Heft 50/52, 17./23./30. Dezemb,, S. 392.
EINWEBER. — **Gleisunterhaltung** bei den belgischen d französischen Eisenbahnen durch das **Schaufelver**ren (Soufflageverfahren). (2 500 Wörter & Abb.)

---

**1943** **351 .712 (.43)**

e Reichsbahn, Heft 5/6, 3./10. Februar, S. 37.
INGEL. — Die **Vergebung von Bauleistungen** (Zur rausgabe der DV Bauleistungen). (7 000 Wörter.)

---

**.943** **656 .223 .2 (.43) & 656 .212 .5 (.43)**

Reichsbahn, Heft 7/8, 17./24. Februar, S. 57.
TISCHER (Wilhelm). — Die Auswirkung der **Beför**ung der Packwagen am Schluss der Güterzüge auf e Umlaufzeit und die Zugbildungsarbeit in den Verebebahnhöfen. (6 000 Wörter.)

---

**943** **656 .2 (0**

Reichsbahn, Heft 9/10, 3./10. März, S. 70.
ÜNTHER (Karl). — Die **Einteilung der Betrieb**len der Eisenbahnen. (6 000 Wörter, Tafeln & Abb.)

**1943** **385 .517 (.43)**

Die Reichsbahn, Heft 14/15, 7./14. April, S. 101.
KUTTER. — Gedanken über eine Ausgestaltung der **Berufsfürsorge** bei den Deutschen Reichsbahn. (6 000 Wörter.)

---

## Zeitschrift des Vereines deutscher Ingenieure. (Berlin.)

**1941** **621 .9**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 11, 15. März, S. 249.
SCHMIDT (W.). — Zur Dynamik der **Werkzeugmaschine.** (8 500 Wörter & Abb.)

---

**1941** **621 .392 & 691**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 12, 22. März, S. 285.
**Korrosionsbeständigkeit geschweisster Aluminiumlegierungen.** Einfluss des Schweissverfahrens, der Blechdicke und der Nachbehandlung. (1 200 Wörter & Abb.)

---

**1941** **669 & 691**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 12, 22. März, S. 294.
**Korrosionsverhalten von Aluminiumlegierungen** höherer Festigkeit. (1 200 Wörter, 1 Zusammenstellung & Abb.)

---

**1941** **621 .335 (.494)**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 13, 29. März, S. 311.
Vierzehnachsige **elektrische Lokomotiven** der Gotthardbahn. (300 Wörter.)

---

**1941** **62. (01**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 13, 29. März, S. 312.
RIXMANN (F.). — Wirkung der Dämpfung bei **Schwingungsentstörung** und **Schwingungsmessung.** (2 800 Wörter & Abb.)

---

**1941** **621 .392**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 14, 5. April, S. 325.
ZAHN (B.). — **Elektroschweissung.** (10 000 Wörter & Abb.)

---

**1941** **62. (01 & 669**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 14, 5. April, S. 341.
KARAS (F.). — **Dauerfestigkeit von Laufflächen** gegenüber Grübchenbildung. (2 600 Wörter, 1 Zahlentafel & Abb.)

---

**1941** **623 (.481)**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 15, 12. April, S. 349.
STOY (W.). — **Brückenbauten** deutscher Eisenbahnpioniere in Norwegen. (4 400 Wörter & Abb.)

---

**1941** **62. (01, 624 & 621 .392**

Zeitschrift des Vereines deutscher Ingenieure, Nr. 15, 12. April, S. 357.
GRAF (O.). — Versuche zur Klarstellung von **Schadenfällen an geschweissten Brücken.** (2 600 Wörter, 1 Zusammenstellung & Abb.)

## Signal und Draht. (Berlin.)

**1944** **656 .251**
Signal und Draht, Nr. 5, 10. April, S. 23.
HOCK. — Die Betreuung der **Propansignallaternen.** (3 000 Wörter.)

**1944** **654 (.43)**
Signal und Draht, Nr. 5, 10. April, S. 25.
HENNIG (K.). — Die für die Unterhaltung der Reichsbahn-**Fernmeldeanlagen** erforderlichen theoretischen Grundlagen. (1 600 Wörter.)

**1944** **654 (.43)**
Signal und Draht, Nr. 6/7, 20. Mai, S. 31.
ZEMAN. — Die Unterhaltung von **Fernmeldefreileitungen.** (4 000 Wörter.)

**1944** **625 .143 .4 & 656 .256**
Signal und Draht, Nr. 6/7, 20. Mai, S. 34.
BEHR. — Die Unterhaltung der **isolierten Schienen.** (3 000 Wörter & Abb.)

**1944** **656 .25 (.43)**
Signal und Draht, Nr. 8, 10. Juni, S. 39.
ERKELENZ (C.). — Über die Verständigung zwischen Unterhaltung und Betrieb bei **Arbeiten an den Sicherungsanlagen.** (5 000 Wörter.)

# In English.

## Bulletin, American Railway Engineering Association. (Chicago.)

**1941** **656 .221**
Bulletin, Amer. Railway Engineering Assoc., November, p. 51.
Report of Committee 16. **Economics of Railway location and operation.** Train resistance of freight trains under various conditions of loading and speed. (5 900 words & fig.)

**1941** **621 .136 .3**
Bulletin, Amer. Railway Engineering Assoc., November, p. 99.
Report of Committee 13. Practicable size of water columns and supply lines for maximum **delivery of waters to locomotive tenders.** (1 000 words & fig.)

**1941** **656 .211 (.73)**
Bulletin, Amer. Railway Engineering Assoc., December, p. 149.
Report of Committee 14. **Yards and terminals.** Modernization of passenger terminals. (8 000 words.)

**1941** **625 .162 (.73) & 656 .254 (.73)**
Bulletin, Amer. Railway Engineering Assoc., December, p. 169.
Report of Committee 9. **Highways.** Comparative merits of various types of **grade crossing protection.** (1 000 words & fig.)

**1942** **624**
Bulletin, Amer. Railway Engineering Assoc., January, p. 243.
Report of Committee 7. **Wood bridges and trestles.** Specifications for design of wood bridges and trestles for railway loading. (5 300 words & tables.)

**1942** **625 .1**
Bulletin, Amer. Railway Engineering Assoc., Januar p. 368.
Report of Committee 15. **Iron and steel structure** Revision of specifications for steel **railway turntable** (3 300 words & fig.)

**1942** **625 .142**
Bulletin, Amer. Railway Engineering Assoc., Februa p. 401.
Report of Committee 3. **Ties.** Investigate and rep on the dimensions of ties, and bring up-to-date the inf mation presented in the 1924 and 1932 Proceedin Cause and control of splitting in railroad ties. (1 2 words.)

**1942** **625 .142 .2 (.73) & 691 (.7**
Bulletin, Amer. Railway Engineering Assoc., Februa p. 413.
Report of Committee 17. **Wood preservation.** Serv tests records for **treated ties.** (3 000 words & tables.)

**1942** **625 .142 .2 (.73) & 691 (.7**
Bulletin, Amer. Railway Engineering Assoc., Februa p. 449.
Report of Committee 17. **Wood preservation.** Effect preservative treatment by the use of creosote-petrole and zinc chloride and petroleum. (1 000 words & tabl

**1942** **625 .14 & 625**
Bulletin, Amer. Railway Engineering Assoc., Febru p. 497.
Report of Committee 1. **Roadway and ballast.** Ef of locomotive blow-offs on track maintenance (1 words.)

**1942** **625 .14**
Bulletin, Amer. Railway Engineering Assoc., Febru p. 519.
Report of Committee 5. **Roadway and ballast.** P and specifications for track tools and recommended m mum limits for reclaimed tools. (1 900 words & tabl

**1942** **625 .15 (**
Bulletin, Amer. Railway Engineering Assoc., Febru p. 522.
Report of Committee 5. **Roadway and ballast.** P for **switches, frogs, crossings, spring and slip switc** (12 000 words, tables & fig.)

## Engineer. (London.)

**1946** **621 .132 .1 (**
Engineer, No. 4723, July 19, p. 60.
NOCK (O. S.). — **British locomotive working** in time. (2 200 words & fig.)

**1946** **621 .132 .3 (.73) & 621 .132 .5 (**
Engineer, No. 4724, July 26, p. 73.
POULTNEY (E. C.). — New York Central **4-8-4 motives.** (3 400 words & fig.)

**1946** **625 .151 6**
Engineer, No. 4724, July 26, p. 86.
Flat-bottom **switches and crossings** on the L. N. R (650 words & fig.)

**1946** **656 (.42)**
ngineer, No. 4724, July 26, p. 87.
**Co-ordination** of road and rail freight transport. 1 600 words.)

## Journal, Institution of Engineers, Australia. (Sydney, N. S. W.)

**1943** **624 .2**
ournal, Institution of Engineers, Australia, No. 1, January, p. 3.
MACKINLAY (K. H.). — Analysis of **continuous ames** containing members with variable moment of ertia. (10 000 words, tables & fig.)

**1943** **62. (01**
ournal, Institution of Engineers, Australia, No. 5, May, p. 111.
KOERNER (C. F.). — The philosophy of **stress con-ntrations.** (2 000 words & fig.)

**1943** **62. (01**
ournal, Institution of Engineers, Australia, No. 9-10, September-October, p. 197.
STANLEY (M. S.). — Analysis of **elastic frames.** 000 words & fig.)

**1943** **625 .1 : 625 .62**
ournal, Institution of Engineers, Australia, No. 11-12, November-December, p. 239.
BLANCH (A. H.). — **Prolonging the life of the tram-ay rail.** (See also No. 6, June 1944, p. 123 of this Journal ») (6 000 words, tables & fig.)

**1944** **625 .112**
urnal, Institution of Engineers, Australia, No. 4-5, April-May, p. 77.
COOK (N.). — The **unified gauge.** (3 000 words map.)

**1944** **625 .25**
urnal, Institution of Engineers, Australia, No. 6, June, p. 105.
WHITE (J.). — **Braking of railway vehicles.** With ecial reference to Australian conditions. (6 000 words fig.)

**1944** **621 .132 .3 (.944)**
urnal, Institution of Engineers, Australia, No. 10-11, October-November, p. 193.
YOUNG (H.). — The **C. 38 class 4-6-2 type locomo-e** in service on the New South Wales Government ailways. (8 000 words & fig.)

## urnal, Institution of Civil Engineers. (London.)

**1946** **656 .213 (.42)**
urnal, Institution of Civil Engineers, No. 7, May, p. 397.
MATTHEWS (W.). — **Railway sidings** for the Hams ll electric power-station of the City of Birmingham ectric Supply Department. (2 800 words & fig.)

## urnal, Permanent Way Institution. (London).

**1942** **625 .113**
urnal, Permanent Way Institution, April, p. 17.
LLOYD OWEN (A.). — **Radius-versine constants.** 0 words & table.)

**1942** **625 .14 (.73)**
Journal, Permanent Way Institution, April, p. 20.
TRATMAN (E. E. R.). — American **permanent way** convention. (1 100 words.)

**1942** **625 .142 .2**
Journal, Permanent Way Institution, April, p. 22.
LUND (H.). — **Sleepers and crossing timbers.** Selection, treatment and utility. (1 400 words.)

**1942** **625 .17 (.54)**
Journal, Permanent Way Institution, April, p. 25.
D'COSTA (A. V.). — Experiments in underpinning and **strengthening of track** on unstable formation, G. I. P. Ry., India. (5 000 words.)

**1942** **625 .151**
Journal, Permanent Way Institution, December, p. 122.
BOOTH (R. G.). — **Spring crossings.** A spring crossing of simplified design. (1 000 words & fig.)

**1942** **625 .173**
Journal, Permanent Way Institution, December, p. 124.
BARNSDALE (A. F. N.). — Some aspects of the yearly **relaying programme.** (1 500 words.)

**1942** **625 .142**
Journal, Permanent Way Institution, December, p. 127.
FLETCHER (B. P.). — Something new in **sleepers** (composite timber sleepers). (1 000 words & fig.)

**1942** **625 .151**
Journal, Permanent Way Institution, December, p. 129.
LETMAN (A. E.). — **Point and crossing maintenance.** (1 100 words.)

**1942** **625 .142 .4**
Journal, Permanent Way Institution, December, p. 132.
KITCHIN (T. E.). — **Concrete sleepers.** Transverse and block types. (1 000 words & fig.)

## Journal and Proceedings, Institution of Mechanical Engineers. (London.)

**1945/1946** **621 .13 (09**
Journal and Proceedings, Institution of Mechanical Engineers (Journal, March 1946; and Proceedings, 1945, vol. 152, No. 4), p. 341.
BULLEID (O. V. S.). — **Locomotives** I have known. (9 000 words & fig.)

**1946** **621 .116**
Journal and Proceedings, Institution of Mechanical Engineers (Journal, June 1946; and Proceedings, 1946, vol. 154, No. 1), p. 52.
SHANNON (W. B.), PRATT (C. W.), WEBB (T. B.) and CARLSON (W. B.). — Expanded tube joints in boiler drums with special reference to the Battersea **high-pressure boilers.** (45 000 words & fig.)

## The Locomotive. (London.)

**1946** **621 .132 .3 (.42)**
The Locomotive, No. 641, January 15, p. 3.
L. N. E. R. **class B2 locomotive.** (250 words & fig.)

**1946** **385.** (09 (.492)
The Locomotive, No. 641, January 15, p. 4.
DERENS (L.). — The **Dutch State Railways Co.** (2 000 words & fig.)

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**1946** **621** .132 .8 (.494)
The Locomotive, No. 641, January 15, p. 15.
**Electrically-heated steam locos.** (400 words & fig.)

---

**1946** **621** .132 .5 (.492)
The Locomotive, No. 641, January 15, p. 18.
DERENS (L.). — 3-Cylinder **goods locomotives.** (1 400 words & fig.)

---

**1946** **621** .132 .8 (.494)
The Locomotive, No. 641, January 15, p. 26.
The first **gaz turbine loco.** (1 500 words & fig.)

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**1946** **621** .132 .3 (.4) & **621** .132 .5 (.4)
The Locomotive, No. 645, May 15, p. 66.
Liberation **2-8-0 locomotives.** (1 300 words & fig.)

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**1946** **621** .132 .1 (.89)
The Locomotive, No. 645, May 15, p. 76.
Post-war **locomotives design.** Central Uruguay Railway. (1 400 words & fig.)

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**1946** **621** .132 .3 (.42) & **621** .132 .5 (.42)
The Locomotive, No. 646, June 15, p. 82.
Recent developments in L. M. S. **locomotive practice.** (1 200 words & fig.)

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**1946** **385.** (09 (.44)
The Locomotive, No. 646, June 15, p. 85.
STEAD (Arthur L.). — French rail re-equipment. (1 000 words & fig.)

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**1946** **621** .132 .1 (.4)
The Locomotive, No. 646, June 15, p. 91.
The first **8-coupled locomotive** in Europe. (900 words & fig.)

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## Modern Transport. (London.)

**1945** **625** .232 (.42)
Modern Transport, November 17, p. 15.
**New L. M. S. coaches.** Derby-built brake thirds. (1 200 words & fig.)

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**1945** **625** .143 .4 (.42)
Modern Transport, November 24, p. 5.
An improved form of **railjoint.** The Ellson joint. (1 000 words & fig.)

---

**1945** **621** .132 .3 (.485) & **621** .132 .5 (.485)
Modern Transport, November 24, p. 9.
New Swedish **steam locomotive.** Modification of Halmstad type. (500 words & fig.)

---

**1945** **621** .132 .8 (.54)
Modern Transport, December 1, p. 4.
**Beyer-Garratt locomotives** for India. For heavy coal traffic on Bengal-Nagpur Railway. (1 400 words & fig.)

**1945** **385.** (09 (.52
Modern Transport, December 8, p. 11.
**Transport in Japan.** Work of Government Railways
Wartime strain on system. (2 100 words & map.)

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**1945** **656** .28 (.42
Modern Transport, December 8, p. 15.
**Accidents on British railways.** Official annual repo
for 1944. (2 400 words.)

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**1945** **656** .211 .5 (.42
Modern Transport, December 8, p. 20.
**New station indicator.** Innovation by L. N. E. R
(800 words & fig.)

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**1945** **621** .132 .3 (.42
Modern Transport, December 15, p. 8.
**Another L. N. E. R. rebuilt locomotive.** Sandringha
class B 17 conversion. (400 words & fig.)

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**1945/1946** **385.** (09 .3 (.4
Modern Transport, December 22, p. 11; January 5, p. 1
**Manchester and Sheffield railway centenary.** An L.
E. R. celebration. (4 600 words & fig.)

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**1945** **621** .132 .3 (.4
Modern Transport, December 22, p. 15.
**A rebuilt L. N. E. R. Mogul.** Conversion of class K
(600 words & fig.)

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**1945** **621** .13 (09 (.4
Modern Transport, December 29, p. 11.
**Crampton's patent locomotives.** A balanced engine
the 'forties. (1 300 words & fig.)

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**1945** **621** .138
Modern Transport, December 29, p. 17.
**Locomotive running shed practice.** Importance of s
tistics. (1 800 words.)

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**1945** **625.** 232 (.4
Modern Transport, December 20, p. 20.
Great Western **dining cars.** New cars and new servic
(700 words & fig.)

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## Railway Age. (New York.)

**1946** **656** .237 .3 (.
Railway Age, April 27, p. 867.
**Micro-filming speeds waybill handling.** (2 200 wo
& fig.)

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**1946** **725** .35 (.
Railway Age, April 27, p. 870.
**Icing plant** speeds perishable traffic. (2 100 wo
& fig.)

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**1946** **385** .1 (.
Railway Age, April 27, p. 873.
WYER (W.). — **Profits** more likely if they 're sha
(3 000 words.)

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**1946** **625** .241 (
Railway Age, May 4, p. 907.
Great Northern buys **low-floor flat cars.** (900 w
& fig.)

**1946** **691** (06 (.73)
ilway Age, May 4, p. 909.
**Wood-preservers** meet at Cincinnati. (5 200 words fig.)

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**1946** **621** .431 .72 (.73)
ilway Age, May 4, p. 913.
)ver the mountain with **Diesel-Electrics.** (2 000 words fig.)

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**1946** **656** .254 (.73)
ilway Age, May 4, p. 916.
D. T. & I. **Tests radio** in Detroit. (1 600 words & fig.)

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**1946** **625** .13 (.73)
ilway Age, May 11, p. 952; May 25, p. 1056.
Two important **tunnels** built in 1945. (5 800 words fig.)

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**1946** **656** .25 (.73)
ilway Age, May 11, p. 959.
Burlington tests show **signals** adequate. (1 000 words fig.)

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**1946** **656** .226 (.73)
ilway Age, May 11, p. 965.
**Railway Express terminal** gets public address system. 50 words & fig.)

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**1946** **621** .431 .72 (.73)
ilway Age, May 25, p. 1062.
First Ingalls **Diesel-electric locomotive.** (1 900 words fig.)

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## Railway Engineering and Maintenance. (Chicago.)

**1941** **691**
ilway Engineering and Maintenance, August, p. 546.
New method of attack on water-tank **corrosion.** (1 500 rds & fig.)

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**1941** **624** .32 (.73)
ilway Engineering and Maintenance, Sept., p. 598.
EAR (G. W.). — **Bridge construction** features line nge on S. P. (2 400 words & fig.)

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**1941** **625** .143 .4 & **665** .882
ilway Engineering and Maintenance, Sept., p. 601.
**Flame-straightening angle bars** in track. (1 800 words ig.)

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**1941** **625** .143 .3 (.73) & **656** .281 (.73)
lway Engineering and Maintenance, Sept., p. 611.
**issured rail derails fast passenger train.** (900 words.)

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**1941** **625** .154 (.71) & **691** (.71)
lway Engineering and Maintenance, October, p. 678.
. N. R. builds **turntable** circle wall of precast con- e sections. (2 500 words & fig.)

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**1941** **625** .151 (.73) & **656** .281 (.73)
lway Engineering and Maintenance, Nov., p. 781.
**pring switch mechanism** causes freight derailment. 00 words.)

**1941** **625** .151 (.73) & **625** .174 (.73)
Railway Engineering and Maintenance, Dec., p. 869.
B. & N. gets ready with 2818 new **switch heaters.** (1 400 words & fig.)

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## Railway Gazette. (London.)

**1946** **656** .211
Railway Gazette, No. 10, March 8, p. 247.
**Design and layout of large passenger stations.** (1 600 words.)

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**1946** **621** .132 .3 (.44)
Railway Gazette, No. 10, March 8, p. 248.
**Liberation class locomotives for France.** (500 words & fig.)

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**1946** **725** .31 (.42)
Railway Gazette, No. 10, March 8, p. 253.
L. M. S. R. **experimental prefabricated station.** (1 100 words & fig.)

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**1946** **385** .113 (.42)
Railway Gazette, No. 10, March 8, p. 258.
L. M. S. R.-23rd annual general meeting. (9 200 words.)

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**1946** **621** .132 .3 (.4)
Railway Gazette, No. 11, March 15, p. 280.
**The Liberation 2-8-0 locomotive for Europe.** (1 600 words & fig.)

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**1946** **624** (.44)
Railway Gazette, No. 11, March 15, p. 282.
**Temporary reconstruction of demolished railway bridges in France.** (2 100 words & fig.)

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**1946** **385** .113 (.42)
Railway Gazette, No. 11, March 15, p. 289.
G. W. R. annual general meeting. (4 700 words.)

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**1946** **385** .113 (.42)
Railway Gazette, No. 11, March 15, p. 293.
S. R. annual general meeting. (7 400 words.)

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**1946** **385** .113 (.42)
Railway Gazette, No. 11, March 15, p. 299.
L. N. E. R. **annual general meeting.** (8 000 words.)

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**1946** **624** .52 (.73)
Railway Gazette, No. 12, March 22, p. 319.
New Pecos Gorge **viaduct,** Southern Pacific. (1 100 words & fig.)

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**1946** **625** .26 (.42)
Railway Gazette, No. 12, March 22, p. 320.
**Modern engineering workshops and stores** at Sheffield, L. N. E. R. (750 words & fig.)

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**1946** **621** .132 .8 (.68)
Railway Gazette, No. 12, March 22, p. 323.
Fifty **Beyer-Garratt locomotives** ordered for the South African Railways. (2 400 words & fig.)

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**1946** **656** .25 (0
Railway Gazette, No. 13, March 29, p. 347.
**The responsibilities of the signal engineer.** (1 500 words.)

**1946** 385 .4 (.42) & 625 .1 (.42)
Railway Gazette, No. 13, March 29, p. 348.
**Organisation of the chief civil engineer's department,** Southern Railway. (1 000 words & chart.)

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**1946** 625 .232 (.73)
Railway Gazette, No. 13, March 29, p. 351.
United States **convertible sleeping car design.** (300 words & fig.)

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**1946** 621 .33
Railway Gazette, No. 13, March 29, p. 352.
**Choice of system for main-line electrification.** (1 100 words.)

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**1946** 621 .9 (.42)
Railway Gazette, No. 13, March 29, p. 355.
A special purpose **planing machine** for points and crossings. (600 words & fig.)

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## Railway Mechanical Engineer. (New York.)

**1942** 621 .132 .8 (.73)
Railway Mechanical Engineer, February, p. 62.
**Alco-G. E. road switchers.** (2 000 words & fig.)

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**1942** 621 .97 (.73)
Railway Mechanical Engineer, March, p. 101.
M. B. M. A. report on **application of rivets.** (3 300 words & fig.)

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**1942** 621 .133 .3 (.73) & 621 .392 (.73)
Railway Mechanical Engineer, June, p. 258.
What about the **all-welded boiler?** (2 700 words & fig.)

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**1942** 621 .392 (.73)
Railway Mechanical Engineer, June, p. 262.
Fabrication by **welding.** (1 100 words & fig.)

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**1942** 625 .26
Railway Mechanical Engineer, July, p. 306.
BARTHELEMY (P .P.). — Great Northern **car-shop devices.** (3 200 words & fig.)

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**1942** 621 .132 .3 (.73)
Railway Mechanical Engineer, August, p. 330.
**Cheasapeake & Ohio buys 4-6-4 passenger locomotives.** (4 600 words & fig.)

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**1942** 621 .132 .5 (.73)
Railway Mechanical Engineer, September, p. 367.
**Progressive changes in Santa-Fe 4-8-4 locomotives.** (2 600 words & fig.)

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**1942** 621 .132 .3 (.42) & 621 .132 .5 (.42)
Railway Mechanical Engineer, September, p. 377.
Southern (England) **mixed traffic locomotives.** (1 000 words & fig.)

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**1942** 625 .212 (.73)
Railway Mechanical Engineer, October, p. 407.
Basic research improves **passenger-truck performance.** (3 700 words & fig.)

## In Spanish.

## Boletin de la Asociacion Internacional Permanente del Congreso Sudamericano de Ferrocarriles. (Buenos-Aires.)

**1944** 385 .113 (.82
Boletin de la Asoc. intern. perm. del Congreso Sudameri de Ferrocarriles, marzo-abril, p. 47.
**Resultados de la explotación** de los Ferrocarriles Arge tinos. Año financiero 1942-43. (700 palabras & cuadros.

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**1944** 385 .113 (.83
Boletin de la Asoc. intern. perm. del Congreso Sudameri de Ferrocarriles, marzo-abril, p. 114.
**Resultados de la explotación** de los Ferrocarriles d Estado de Chile. (600 palabras & cuadros.)

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**1944** 656 .281 (
Boletin de la Asoc. intern. perm. del Congreso Sudameri de Ferrocarriles, marzo-abril, p. 121.
LAFFITTE-MARTINEZ (C.). — Teoria del **desca rilamiento.** (4 000 palabras & fig.)

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**1944** 6
Boletin de la Asoc. intern. perm. del Congreso Sudameri de Ferrocarriles, mayo-junio, p. 11.
GRINDLEY (H. H.). — Algunas reflexiones sob **los Ferrocarriles en el periodo de post-guerra.** (7000 pa bras.)

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**1944** 385 (.7 +
Boletin de la Asoc. intern. perm. del Congreso Sudamer de Ferrocarriles, mayo-junio, p. 108.
NUNEZ BRIAN (J.). — Estado comparativo de **Ferrocarriles del Continente segun superficie y poblaci** (400 palabras & cuadro.)

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**1944** 385 (.
Boletin de la Asoc. intern. perm. del Congreso Sudamer de Ferrocarriles, julio-agosto, p. 35.
NUNEZ BRIAN (J.). — **Historia de los Ferrocarri del Dominio del Canada** e influencia sobre el progr del pais. (6 000 palabras & fig.)

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**1944** 385 .113 (.
Boletin de la Asoc. intern. perm. del Congreso Sudame de Ferrocarriles, septiembre-octubre, p. 94.
PARMELEE (J. H.). — Examen de la **explotac ferroviaria** en 1943. (4 000 palabras & cuadros.)

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**1944** 621 .33 (.4 + .5 +
Boletin de la Asoc. intern. perm. del Congreso Sudame de Ferrocarriles, septiembre-octubre, p. 112.
WAKEFIELD ADAM (W.). — **Electrificación de Ferrocarriles** en Gran-Bretaña, en sus Dominios y en extranjero. (2 500 palabras & fig.)

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## Ferrocarriles y Tranvias. (Madrid.)

**1942**
Ferrocarriles y Tranvías, agosto, p. 222.
LUCINI (M.). — Las **líneas telefónicas** de hie (2 000 palabras & fig.)

**1942** **385 .3 (.460)**
rocarriles y Tranvías, agosto, p. 235.
ormas para la **Inspección del Estado** en ferrocarriles. 00 palabras.)

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**942** **621 .138 (.460) & 625 .26 (.460)**
rocarriles y Tranvías, octubre, p. 286.
OTIN (C.). — El esfuerzo para la puesta a punto os **parques de material motor y móvil.** (1 600 pala-, 5 cuadros & fig.)

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**942** **656 .231**
rocarriles y Tranvías, octubre, p. 292; noviembre, p. 326.
ANIAGUA (E.). — **Estudio matematico sobre las as** ferroviarias racionales. (9 000 palabras & fig.)

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**942** **385 .4 (.44)**
rocarriles y Tranvías, noviembre, p. 335.
HATEL. — La **normalización en los transportes ferro-ios.** (2 000 palabras.)

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**942** **385 (093 (.460)**
rocarriles y Tranvías, diciembre, p. 350.
EDRO AZA. — Una aportación à la « **prehistoria** » a linea del Norte. (3 000 palabras.)

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**942** **621 .132 .1 (.44)**
rocarriles y Tranvías, diciembre, p. 367.
vestigaciones actuales sobre **locomotoras francesas ipos nuevos** y modificaciones o perfeccionamientos de inas de tipos clasicos (« Revue Générale des che- de fer », abril 1942). (2 500 palabras & fig.)

## In Italian.

### sta tecnica delle Ferrovie italiane. (Roma.)

**41** **621 .331 (.45)**
sta tecnica delle ferrovie italiane, 15 maggio, p. 205.
NTI (G. B.). — La **sottocentrale di conversione** o Genova. (4 500 parole, 1 tabella & fig.)

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**41** **621 .336**
ta tecnica delle ferrovie italiane, 15 maggio, p. 219.
AGNI (E.). — La **stabilità del pantografo** in rela- alle caratteristiche elastiche del veicolo per il iale elettromotore leggero a. c. c. (6 000 parole .)

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**41** **656 .235 (.45)**
ta tecnica delle ferrovie italiane, 15 maggio, p. 232.
NTORO (F.). — Curve di differenzialità delle **merci.** (3 000 parole & fig.)

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**41** **656 .257 (.45)**
a tecnica delle ferrovie italiane, 15 giugno, p. 249.
GET (C.). — Il banco di manovra tipo F. S. per **ati centrali elettrici.** (11 000 parole & fig.)

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**41** **621 .431 .72 (.45)**
a tecnica delle ferrovie italiane, 15 luglio, p. 297.
MMI (V.). — **Automotrice articolata** da 104 posti ere per le ferrovie Calabro-Lucane. (4 500 parole )

**1941** **621 .332 (.45)**
Rivista tecnica delle ferrovie italiane, 15 luglio, p. 311.
PROSPERI (L.). — Come le recenti nórme legislative per l'esecuzione delle **linee elettriche aeree** esterne regolano gli attraversamenti. (5 500 parole, 2 tabelle & fig.)

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**1941** **624 (.497 .1)**
Rivista tecnica delle ferrovie italiane, 15 agosto, p. 345.
DE DOMINICIS (A.). — **Ripristino linea** Postumia-Lubiana. (2 400 parole & fig.)

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**1941** **669 & 691**
Rivista tecnica delle ferrovie italiane, 15 agosto, p. 356.
ABBOLITO (F.). — La **corrosione dei metalli.** (5 000 parole, 1 tabelle & fig.)

## In Dutch.

### Spoor- en Tramwegen. (Utrecht.)

**1941** **656**
Spoor- en Tramwegen, Nr 19, 13 September, p. 359; Nr 20, 27 September, p. 380.
De economische waarde van het **verkeer.** (3 500 woorden.)

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**1941** **625 .42 (.45)**
Spoor- en Tramwegen, Nr 19, 13 September, p. 363.
De **Ondergrondsche Spoorweg** te Rome naar de Wereldtentoonstelling. (1 200 woorden & fig.)

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**1941** **625 .234**
Spoor- en Tramwegen, Nr 19, 13 September, p. 365.
KARSKENS (J. J.). — **Gasverwarming** bij rijtuigen. (1 100 woorden & fig.)

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**1941** **621 .132 .1 (.68)**
Spoor- en Tramwegen, Nr 21, 11 October, p. 400.
**Locomotieven** van de Zuid-Afrikaansche Spoorwegen. (2 500 woorden, 8 tabellen & fig.)

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**1941** **721 .1**
Spoor- en Tramwegen, Nr 22, 25 October, p. 415.
WIJGMANS (J.). — **Bodemonderzoek** met het snelsteekapparaat. (1 000 woorden & fig.)

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**1941** **621 .431 .72 & 656 .222 .1**
Spoor- en Tramwegen, Nr 23, 8 November, p. 431.
LABRIJN (P.). — Bepaling van de **maximum snelheid,** de **aanzettijd** en de **aanzetweg** voor stoom- en dieseltreinen. (2 500 woorden & fig.)

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**1941** **385. (09 (.492)**
Spoor- en Tramwegen, Nr 24, 22 November, p. 449.
VAN SETTEN (D.). — 25 jaar « **Nederlandsche Spoorwegen** ». (7 000 woorden & fig.)

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**1941** **656 .234 (.492)**
Spoor- en Tramwegen, Nr 24, 22 November, p. 458.
DE GRAAFF (W. J.). — **Verkeersbehoefte en verkeersvoorziening.** (3 000 woorden.)

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**1941** **656 .212 .8 & 656 .223 .2**
Spoor- en Tramwegen, Nr 25, 6 December, p. 469.
BOOGAARD (C.). — Mogelijkheden van **vervoer per spoor van groote en/of zware voorwerpen.** (2 300 woorden & fig.)

**1941** **385. (09 .1 (.82)**
Spoor- en Tramwegen, Nr 25, 6 December, p. 479.
De **spoorwegen** van Argentinië. (600 woorden, 1 tabel & 1 kaart.)

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**1941** **625 .176**
Spoor- en Tramwegen, Nr 26, 20 December, p. 487.
Iets over **spoorwijdten.** (1 000 woorden.)

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**1942** **621 .132 .8 (.494)**
Spoor- en Tramwegen, Nr 1, 3 Januari, p. 1.
LABRIJN (P.). — De eerste **gasturbinelocomotief.** (800 woorden & fig.)

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**1942** **385 .15 (.494)**
Spoor- en Tramwegen, Nr 1, 3 Januari, p. 7.
**Fusie van particuliere spoorwegen** in Zwitserland. (500 woorden & fig.)

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**1942** **656 (.492)**
Spoor- en Tramwegen, Nr 2, 17 Januari, p. 19.
De omvang van het **goederenvervoer** in Nederland. (3 500 woorden & 2 tabellen.)

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**1942** **625 .17 (.492)**
Spoor- en Tramwegen, Nr 2, 17 Januari, p. 23; Nr 3, 31 Januari, p. 44.
CUPERUS (J. L. A.). — Eenige mededeelingen over **baanversterking.** (3 600 woorden & fig.)

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**1942** **656 .24**
Spoor- en Tramwegen, Nr 3, 31 Januari, p. 39.
ERKENS (P. J.). — **Manco** en over. (3 500 woorden & 2 tabellen.)

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**1942** **621 .33 (.494)**
Spoor- en Tramwegen, Nr 4, 14 Februari, p. 65.
**Electrificatie** van de lijn over den Brünig. (1 500 woorden & fig.)

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**1942** **625 .231**
Spoor- en Tramwegen, Nr 5, 28 Februari, p. 77.
KARSKENS (J. J.). — **Bagagewagens.** (4 000 woorden & fig.)

## In Portuguese.

### Gazeta dos Caminhos de ferro. (Lisboa.)

**1940** **385. (01 (.67)**
Gazeta dos Caminhos de ferro, nº 1258, 16 de Maio, p. 303.
Carlos Roma MACHADO. — O **Caminho de ferro e a colonizaçâo** africana. (1 800 palavras & fig.)

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**1940** **385. (01 (.67)**
Gazeta dos Caminhos de ferro, nº 1261, 1 de Julho, p. 453.
Carlos Roma MACHADO. — O **caminho de ferro e a colonizaçâo** na Africa Portugueza. (2 000 palavras, 1 tabela & fig.)

### Revista das Estradas de ferro (Rio de Janeiro

**1940** **651 (.8**
Revista das Estradas de ferro, 15 de agosto, p. 2725.
MORAES (Olegario Marciano). — A Estrada de fer Sorocabana e a **applicacâo dos Serviços mechanicc** (1 200 palavras.)

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**1940** **385 (.8**
Revista das Estradas de ferro, 15 de outubro, p. 276
**Estradas de ferro** no Brasil. (1 200 palavras.)

## In Rumanian.

### Revista C. F. R. (Bucuresti.)

**1940** **621 .131 .3 (.498) = 5**
Revista C. F. R., nº 1-3, janvier-mars, p. 1.
MOCEAROV (N.). — **Essais des locomotives** des C mins de fer roumains. (5 700 mots & fig.)

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**1940** **621 .131 .3 (.498) = 5**
Revista C. F .R., nº 1-3, janvier-mars, p. 20.
SERBESCU (Fl.). — Les essais des locomotives Chemins de fer roumains à l'aide du **wagon-dynamomè** (6 700 mots & fig.)

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**1940** **621 .132 .3 (.498) =**
Revista C. F. R., nº 1-3, janvier-mars, p. 33.
ANUSCA (N.). — Nouvelle **locomotive 1 D 2 p trains rapides** des Chemins de fer roumains. (3 000 n & fig.)

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**1940** **625 .142 .4 =**
Revista C. F. R., nº 1-3, janvier-mars, p. 43.
MITRAN (G.). — **Traverses en béton armé** pour v ferrées. (5 800 mots & fig.)

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**1940** **621 .431 .72 (.498) = 59**
**[625 .23 (.498) =**
Revista C. F. R., nº 9-12, septembre-décembre, p.
GROFSOREANU (Gh.). — **Voitures et automot métalliques** des Chemins de fer roumains. (8 000 n fig. et planche hors texte.)

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**1941** **625 .143 .2 =**
Revista C. F. R., nº 1-3, janvier-mars, p. 23.
JONESCU (P. Th.) & LUCA (G.). — Améliora de la **qualité des rails** de chemins de fer. (5 200 r 5 tableaux & fig.)

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**1943** **621 .132 .1 (.498) =**
Revista C. F. R., nº 1-4, janvier-avril, p. 8.
SERBESCU (Fl.). — **Nouveaux types de locomo** aux Chemins de fer roumains. (8 000 mots, tabl & fig.)

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**1943** **656 .1 (.498) =**
Revista C. F. R., nº 5-6, mai-juin, p. 91.
Le service des **transports automobiles** des Chemi fer roumains. (24 000 mots & fig.)

M. Weissenbruch Co., Ltd., Printer of the King, 49, rue du Poinçon, Bruxelles.